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State of the Education Report for India 2023
Education to Address Climate Change

UNESCO Education Sector

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SEEDS OF CHANGE EDUCATION TO ADDRESS CLIMATE CHANGE

State of the Education Report for India 2023

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Front cover image

Pre-school children are taught to love and respect the environment on a nature walk. The Planet Discovery Centre, CEE, Gujarat.

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SEEDS OF CHANGE

State of the Education
Report for India 2023

**Education to Address
Climate Change**



Message

Director
National Council of Educational
Research and Training (NCERT)

The National Council of Educational Research and Training (NCERT) is delighted to know that the UNESCO New Delhi Regional Office has developed its fifth edition of the State of the Education Report for India on the pivotal theme of education to address climate change.

The National Curriculum Framework for School Education (NCFSE) 2023, which was released recently, addressed climate change under environmental education (EE). EE is one of a few thrust areas highlighted in the NCFSE 2023, whereby adequate importance has been given to this domain of knowledge and emphasis has been laid on integrating related concepts across all stages of school education.

Integrating climate change education at every stage of education in India is crucial as it empowers students with the knowledge, skills and awareness needed to address the pressing challenges of climate change.

The NCERT's commitment to addressing climate change through school education aligns seamlessly with the vision of the National Education Policy (NEP) 2020. The NEP recognizes the transformative power of education and emphasizes the need to nurture environmentally conscious citizens.

The NCERT has made dedicated efforts to empower teachers and teacher-educators by providing essential knowledge resources such as textbooks, supplementary material, project

books and teacher-training manuals, and by engaging communities in its popularization programmes and awareness campaigns. These initiatives aim to motivate, inspire and mentor young learners to take proactive measures to address climate change.

While we take pride in our accomplishments, we acknowledge the evolving nature of climate change challenges. We are continuing our journey towards uninterrupted improvement and adaptability. It is a journey that demands collaboration and inclusivity, ensuring that every child, regardless of their background, may become an active ambassador in shaping a climate-resilient future.

I compliment UNESCO New Delhi on bringing out this publication, and I hope that this initiative will furnish a diverse group of stakeholders within the education sector with valuable evidences, enabling them to improve upon existing best practices and explore even more innovative approaches.

I hope this report complements the aspirations and vision of the NEP 2020 followed by the NCFSE 2023.

I trust this report will be an informative guide for programmes directed towards climate change education.

Professor Dinesh Prasad Saklani

Director
NCERT



Above: Students walk past a board illustrating the Sustainable Development Goals. ASN School, New Delhi.

Foreword

As we witness recurring news of extreme heatwaves, wildfires and cyclones, it is undeniable that the impact of climate change on our communities and environment is happening now. While various approaches are needed to address climate change, education must be at the heart of climate action.

This fifth edition of the UNESCO New Delhi Regional Office's annual flagship publication, State of the Education Report for India, is dedicated to the pivotal role of education in addressing climate change and emphasizes the urgency of prioritizing education to come up with sustainable and long-term solutions to this global crisis.

The international community's recognition of the importance of education and training to address climate change is not new – there have been meetings, conventions, agreements and calls to action for governments to educate, empower and engage all stakeholders on policies and actions relating to climate change. However, now is the time to intensify these efforts and act decisively.

UNESCO continues to promote climate change education, emphasizing unified action, political commitment and engagement of stakeholders. This is being pursued through our contribution towards Education for Sustainable Development (ESD), a global framework and declaration to implement climate change education through policy changes.

In September 2022, the United Nations Secretary-General launched the Greening Education Partnership, a global call for a multistakeholder approach to empower education systems to address climate change. The Greening Education Partnership focuses on the four pillars of: greening schools, greening curriculum, greening teacher training and education systems' capacities, and greening communities. This report addresses India's state of education in relation to these pillars.

India provides some inspiring examples when it comes to innovative policy-making for education to address climate change. Through India's National Education Policy 2020 and the revised National Curriculum Framework for School Education, there have been significant strides made by the Ministry of Education in India to address the issue. In the same measure, the Ministry of Environment, Forest and Climate Change is also engaging through initiatives such as Mission Lifestyle for Environment (LiFE), which leverages education to promote a sustainable mindset and behaviour in India's future generations.

UNESCO hopes that this report will contribute to further promoting the role of education in addressing climate change in India by providing relevant and useful information for all. Education is a transformational tool in our fight against climate change – when we know better, we can do better. Educational systems must adapt to equip younger generations with the knowledge, skills and competencies to prepare them for the impacts of climate change.

I wish to extend my sincere thanks to all those who contributed to the development of this publication, in particular to each of the editorial board members, as well as to UNICEF India, the British Council in India and the Mobius Foundation for their generosity in supporting this publication. UNESCO looks forward to continuing partnerships to advance education so as to plant the seeds of change for a better tomorrow.



Tim Curtis

Director and UNESCO Representative to Bhutan, India, Maldives and Sri Lanka



UNICEF India's initiatives on Climate Change and Education



Climate change is increasingly being recognized as an important issue in India. There is growing recognition amongst children, especially, on climate change as it is impacting their lives. Education is crucial to promote climate action as it helps people understand and address the impacts of the climate crisis, empowering them with the knowledge, skills, values and attitudes needed to act as agents of change. In the recent past, UNICEF has engaged with members of national focus group on environmental education to impress upon the need to integrate climate change elements into the

new National Curriculum Framework (NCF). States will adapt the NCF to their specific contexts and prepare their own versions of the textbooks to be used in schools. UNICEF, in collaboration with state governments, is also tapping into ongoing existing programmes to integrate key elements of climate change. These include school safety programmes, child cabinets, and adolescent and youth platforms at the school level. All these existing interventions are being implemented in collaboration with respective state governments and partners.

The key interventions of UNICEF India implemented with the support of state governments are outlined below:

1 Integration of climate change in school safety programmes

- In Bihar, the Bihar Education Project Council (BEPC), with technical support from UNICEF, integrated elements of climate change in the ongoing comprehensive school safety programme intervention reaching 8.4 million children from 70,000 schools.
- In Chhattisgarh, UNICEF supported Samagra Shiksha in the roll-out of a school safety programme reaching 5 million children with the support of 37,000 teachers in 45,000 schools.
- In Jammu & Kashmir, a comprehensive school safety programme with integration of climate change is being rolled out to benefit 30,000 children and 5,000 teachers in around 1,000 schools.
- In Gujarat, UNICEF supported Samagra Shiksha and GIDM in the development of a self-paced course on school safety and security reaching over 33,000 schools.

2 Adolescent platforms

- In Uttar Pradesh, a children's convention on climate change was organized with the participation of 6,000 children from 240 upper primary and composite schools across 20 districts of Uttar Pradesh. This convention was the culmination of a week-long campaign on climate change.
- UNICEF successfully advocated for statewide upscaling of a climate change campaign by the 45,000 Meena Manch platforms for adolescents in government-run upper primary schools of the state.

3 Curriculum

- In Kerala, curriculum review led to the incorporation of climate change and disaster management measures into state syllabi with the support of UNICEF.
- In Maharashtra, integration of climate and environment lesson plans were developed by the state government with support from UNICEF for early grades to cover 65,000 primary schools and 10,000 teachers.

Way forward

Scale up climate change initiatives and interventions at the state level

Development of learning resources / materials on climate action (digital, non-digital) for teachers and students in regional languages

Develop comprehensive teacher-training courses on climate change including online

Integration of climate change into the new curriculum framework and its roll-out

Develop framework and indicators for greening of schools and support in development of standards

Conduct research studies and generate evidence around climate change

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Abbreviations and acronyms

ABFRL	Aditya Birla Fashion and Retail	EOSE	Environmental Orientation to School Education
ACCU	Asia-Pacific Cultural Centre for UNESCO	ESD	Education for Sustainable Development
ACE	Action for Climate Empowerment	EU-REI	European Union-Resource Efficiency Initiative
AECC	Ability Enhancement Compulsory Course	FEE	Foundation for Environment Education
AI-ML	Artificial Intelligence-Machine Learning	FFI	Fossil Fuel and Industry
AICTE	All India Council for Technical Education	FLN	Foundational Literacy and Numeracy
AR	Assessment Report (of the IPCC)	FRI	Forest Research Institute
B.Ed.	Bachelor of Education	G20	Group of Twenty
BEE	Bureau of Energy Efficiency	GAP	Global Action Programme on Education for Sustainable Development
BUR	Biennial Update Report	GCF	Green Climate Fund
CBCS	Choice Based Credit System	GDP	Gross Domestic Product
CBD	Convention on Biological Diversity	GEER	Gujarat Ecological Education and Research Foundation
CCE	Climate Change Education	GEP	Greening Education Partnership
CCPI	Climate Change Performance Index	GHG	Greenhouse Gas
CDM	Clean Development Mechanism	GLOF	Glacial Lake Outburst Flood
CDP	Climate Displaced Persons	GSI	Green School Initiative
CDRI	Coalition for Disaster Resilient Infrastructure	GSP	Green School Programme
CEE	Centre for Environment Education	IBEF	India Brand Equity Foundation
CER	Certified Emission Reduction	IDMC	Internal Displacement Monitoring Centre
CIET	Central Institute of Educational Technology	IEA	International Energy Agency
CII	Confederation of Indian Industry	IFS	Indian Forest Service
CO ₂	carbon dioxide	IGBC	Indian Green Building Council
CO ₂ -eq.	carbon dioxide equivalent	IIEE	Indian Institute of Ecology and Environment
COP	Conference of the Parties	IIFM	Indian Institute of Forest Management
CPREEC	C.P.R. Environmental Education Centre	IIM	Indian Institute of Management
CSE	Centre for Science and Environment	IIT	Indian Institute of Technology
CSO	Civil Society Organization	ILO	International Labour Organization
CSR	Corporate Social Responsibility	IMF	International Monetary Fund
DC	Designated Consumer	IMD	Indian Meteorological Department
DIET	District Institute for Education and Training	IMF	International Monetary Fund
DIKSHA	Digital Infrastructure for Knowledge Sharing	IPCC	Intergovernmental Panel on Climate Change
DSEL	Department of School Education and Literacy (Ministry of Education)	IRENA	International Renewable Energy Agency
ECCE	Early Childhood Care and Education	ISA	International Solar Alliance
EE	Environmental Education	IUCN	International Union for Conservation of Nature
EESS	Environment Education in the School System	IYCN	Indian Youth Climate Network
ENVIS	Environmental Information System		

LIFE	Lifestyle for Environment	NPCCHH	National Programme on Climate Change and Human Health
LT-LEDS	Long-Term Low-Emission Development Strategy	NSS	National Service Scheme
MGIEP	Mahatma Gandhi Institute of Education for Peace and Sustainable Development	NSSP	National School Safety Programme
MHRD	Ministry of Human Resource Development	NYKS	Nehru Yuva Kendra Sangathan
MNRE	Ministry of New and Renewable Energy	OECD	Organisation for Economic Co-operation and Development
MoE	Ministry of Education (previously MHRD)	PBL	Project-based learning
MoEFCC	Ministry of Environment, Forest and Climate Change	Ph.D.	Doctor of Philosophy
MoSPI	Ministry of Statistics and Programme Implementation	PIB	Press Information Bureau
MSDE	Ministry of Skill Development and Entrepreneurship	ppm	parts per million
MSSRF	M S Swaminathan Research Foundation	PTSD	Post-Traumatic Stress Disorder
MUN	Model United Nations	RTE	Right of Children to Free and Compulsory Education
MYCA	Maharashtra Youth for Climate Action	SCERT	State Council of Educational Research and Training
NABARD	National Bank for Agriculture and Rural Development	SCGJ	Skill Council for Green Jobs
NAFCC	National Adaptation Fund for Climate Change	SDG	Sustainable Development Goal
NAPCC	National Action Plan on Climate Change	SEC	Specific Energy Consumption
NASA	National Aeronautics and Space Administration	SIDS	Small Island Developing State
NATCOM	National Communications to UNFCCC	SoER	UNESCO's State of the Education Report for India
NBT	National Biodiversity Target	TCI	The ClimAct Initiative
NCERT	National Council of Educational Research and Training	TERI	The Energy and Resources Institute
NCF	National Curriculum Framework	TISS	Tata Institute of Social Sciences
NCFSE	National Curriculum Framework for School Education	TLM	Teaching-Learning Material
NCVET	National Council for Vocational Education and Training	UDISE	Unified District Information System for Education
NDC	Nationally Determined Contribution	UGC	University Grants Commission
NDMA	National Disaster Management Authority	UN	United Nations
NEAC	National Environment Awareness Campaign	UNCCD	United Nations Convention to Combat Desertification
NEC	Nature Education Camp	UNDRR	United Nations Office for Disaster Risk Reduction
NEP	National Education Policy	UNEP	United Nations Environment Programme
NGC	National Green Corps	UNESCO	United Nations Educational, Scientific and Cultural Organization
NIAS	National Institute of Advanced Studies	UNETS	United Nations Education Transformation Summit
NISHTHA	National Initiative for School Heads' and Teachers' Holistic Advancement	UNFCCC	United Nations Framework Convention on Climate Change
NMEEE	National Mission for Enhanced Energy Efficiency	UNICEF	United Nations Children's Fund
NMSA	National Mission for Sustainable Agriculture	UNISDR	United Nations International Strategy for Disaster Reduction
NMSHE	National Mission for Sustaining the Himalayan Ecosystem	USD	United States Dollar
NMSKCC	National Mission on Strategic Knowledge for Climate Change	VSHSE	Vocationalisation of Secondary and Higher Secondary Education
NOAA	National Oceanic and Atmospheric Administration	WEF	World Economic Forum
		WG	Working Group
		WHO	World Health Organization
		YFC	Youth for Climate India



Executive summary

To address climate change effectively through education, a fundamental shift in educational approaches is crucial. Until recently, education prioritized conventional subjects, but there is now a growing acknowledgement and acceptance of the urgent need to integrate fundamental aspects of climate change education into the school curriculum.

In India, the National Education Policy (NEP) 2020 emphasizes the integration of environmental awareness and sustainability into school curricula and, through the 2023 National Curriculum Framework for School Education (NCFSE), the country recognizes environmental

education as a multidisciplinary field that has connections to all subjects. Incorporating relevant elements of climate change into education at all stages equips learners and young people with the knowledge, skills, behaviour and initiative to become responsible agents in coming up with climate solutions.

It is also crucial to recognize that policies, no matter how well-conceived, should be translated into tangible actions and effective implementation. While the NEP 2020 and the NCFSE lay a strong foundation for environmental education in India, their success hinges ultimately on the practical steps taken and partnerships built to contribute towards schools and educational institutions across the nation.

About the report



This report focuses on the intersection of two Sustainable Development Goals (SDGs) – Quality Education (SDG 4) and Climate Action (SDG 13) – in the context of India, particularly Target 4.7 (Education for Sustainable Development [ESD] and Global Citizenship Education) and Target 13.3 (building knowledge and capacity to address climate change).

This report has been developed for stakeholders in the Indian education sector to serve as a comprehensive reference document for informing policies and initiatives, shaping systemic integration, guiding classroom interactions and inspiring community action in education to address climate change. At the same time, this report also emphasizes, to policy- and decision-makers in the climate change sector, the need to prioritize education as a crucial tool to address climate change and to inspire climate actions with the required knowledge, attitudes, skills and mindset.

This report focuses on the intersection of two Sustainable Development Goals (SDGs) – Quality Education (SDG 4) and Climate Action (SDG 13)

– in the context of India, particularly Target 4.7 (Education for Sustainable Development [ESD] and Global Citizenship Education) and Target 13.3 (building knowledge and capacity to address climate change). This report aims to highlight how the interlinkages of these two elements of sustainable development come together and contribute, through designing policies, initiatives and actions, to addressing climate change through education. Using evidence-based analysis, this report demonstrates how systematically integrating holistic climate education from the early school stage to higher education can amplify climate actions and generate climate solutions. It also shows how climate actions in schools, educational institutions and at the community level can mitigate the vulnerabilities of the education system and society. Along these lines, this report explores both the current challenges to integrating climate change into various aspects of education and describes opportunities to address this issue through education.

Finally, this report lists recommendations for concrete action that all education stakeholders in India must take towards realizing relevant and effective education to address climate change in the country.



Above: Young students reuse plastic bottles as pots for plants. ASN School, New Delhi.

Key findings

Education to address climate change in India

This report begins by delving into the context of how India addresses climate change through education. Also outlined are analyses of the various impacts of climate change on the education sector on the one hand, and the role of education in addressing climate change on the other.

Climate change has several tangible and intangible impacts on the overall education ecosystem, particularly in India, caused by increasing heat stress and heatwaves, erratic weather events, climate-induced displacement and migration. These impacts affect learners, their learning environments and learning opportunities, and result in increased health risks for children due to various factors associated with climate change.

The effects of climate change further exacerbate the existing challenges of providing equitable access to quality education in India, particularly for low-income and vulnerable populations across the country. One of the ways to address and alleviate this is by greening education – making education infrastructure and institutions climate-ready and climate-resilient (greening

schools), integrating climate change education in curricula (greening curriculum), training teachers, policy-makers, school leaders and education stakeholders on climate change (greening teacher training and education systems' capacities), and integrating climate change into lifelong learning (greening communities). These are the four pillars of the Greening Education Partnership (GEP), a global initiative towards climate action that was launched by the United Nations Secretary-General at the Transforming Education Summit in September 2022, and to which UNESCO serves as the secretariat. This report analyses India's educational context through the GEP's four pillars, and brings to light the various initiatives and innovations currently in place to promote climate change education.

In India, the importance of climate change education has been recognized and several wide-ranging educational programmes are being taken up to raise awareness and increase understanding of climate change. These encompass policy-level integration of climate education in the curriculum; programmes and initiatives within schools and colleges; development and delivery of teachers' training and resources; awareness campaigns and green-skilling programmes for the youth; and initiatives empowering local communities to

promote climate-resilient actions. Such initiatives are steered by various stakeholders including national and state governments, educational institutions, educators, multilateral organizations, civil society organizations, the youth as well as the private sector. This report features some of these initiatives and highlights several case studies that demonstrate the ingenuity of Indian stakeholders in mitigating and adapting to climate change.

As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), India also actively works to empower all members of society to engage in climate solutions, as stated under Article 6 of the Convention and Article 12 of the Paris Agreement, which is now referred to as Action for Climate Empowerment (ACE). From an education perspective, this report has compiled the various policy initiatives and government-led programmes in India around the six elements of ACE: education, training, information, awareness, public participation and international cooperation on climate change.

Throughout the country, climate change education is currently included as part of environmental education, albeit in a limited way. India is one of the few countries around the world where environmental education has been mandated in formal education by the Supreme Court through a directive in 1991. Subsequently, this led to the National Council of Educational Research and Training (NCERT)'s introduction of the subject of environmental studies at the primary education stage as per the 2005 National Curriculum Framework. For students in higher grades, some concepts of climate change were integrated in subjects that were already taught, such as science and geography.

This report also analyses the pedagogical approaches that are more effective in enhancing climate change learning. Such pedagogies make the teaching-learning experience more engaging and deepen the understanding of climate change issues in local contexts, as well as reinforce learners' capacity to take and lead local actions.



Right: Art activities can help teach the importance of practising the 6 'R's. The Planet Discovery Centre, CEE, Gujarat.

Challenges for India

Addressing challenges requires efforts and actions from schools, education institutions, educators and teachers to bridge the gaps and enhance education systems' capacities to integrate climate change.

Given the complexity of climate change, the expanse of India's education system and the existing issues in the Indian education sector, the task of addressing climate change through education comes with its own sets of challenges.

This report points to a range of concerns around education addressing climate change meaningfully – the first of which is defining the purview of climate change education while integrating it in the curriculum, given its overlaps with environmental education and Education for Sustainable Development. It then becomes incumbent upon curriculum developers and textbook writers to ensure that the crucial elements of climate change education and its local contextualization are emphasized and infused in a systematic, interdisciplinary and progressive manner.

There are also gaps in policies at the global and national level, particularly those addressing

climate change without prioritizing education on climate change. This report explores multiple dimensions of the challenges in this regard, covering a range of issues – from gaps in policies, teachers' training and teaching resources, to gaps in curricula, effective pedagogies, assessment and green skills, and gaps in financing and implementation. This requires efforts and actions from schools, education institutions, educators and teachers to bridge the gaps and enhance education systems' capacities to integrate climate change.

The displacement and loss of learning due to climate calamities is also one of the challenges aggravating issues of access, equity and quality of education. Lastly, financing climate change education has been identified as a challenge in view of other developmental priorities for the country.

Opportunities for India

Although there are challenges with regard to climate change education, there are also opportunities to integrate it in the Indian education system. This is possible by leveraging the urgent need to meet India's global climate commitments and national objectives, as well as by building a climate-resilient society that can optimize individual and collective action to better prepare for and minimize the risks and impacts of climate change.

One of the first opportunities to integrate climate change in the curriculum is presented in the forthcoming implementation of the 2023 National Curriculum Framework for School Education, which offers a chance for education stakeholders to update and revise school curricula, syllabi and textbooks across all grades and subjects. This will open up the opportunity to address the challenge of integrating climate change concepts and content in a systematic, progressive and holistic manner across different subjects and grades, by adopting an interdisciplinary approach, local contextualization and systems thinking.

Integration also allows for the possibility of updating and developing pre-service and in-service teacher training courses that can help teachers and educators attain continuous professional development by learning

contemporary topics such as climate change and sustainability.

This will orient teachers towards the various teaching-learning approaches and pedagogies that can be adopted for effective climate change learning. Moreover, the school education system can benefit tremendously from whole-school engagement, such as upgrading school facilities and operations for increased climate safety, adopting sustainability aspects in their governance, and engaging with communities and building partnerships. As a result, school systems will be encouraged to be more resilient, inclusive and conscious of climate-friendly values and attitudes, and to encourage learners to practise what is preached. Besides these initiatives at the school level, the higher education level also holds immense potential for integrating climate change education, one notable example being the recent introduction of guidelines and curriculum frameworks for undergraduate-level environmental education (UGC, 2023).

Finally, this report also highlights issues of empowering communities, reconsidering and preserving traditional knowledge systems, and fostering partnerships among all stakeholders in India to sustain ownership of climate action and advance climate education nationwide.



The way forward

The following ten recommendations describe actions to tackle these challenges and risks:

RECOMMENDATION 1

Emphasize the urgent need for collective action to address climate change through education.

RECOMMENDATION 2

Include a climate change education component in all development policies.

RECOMMENDATION 3

Integrate climate change education at all stages of education.

RECOMMENDATION 4

Support educational institutions to be green and climate-ready.



Above: Boys and girls being taught about medicinal plants. Sanjeevani Medicine Garden, Gujarat.

RECOMMENDATION 5
Embed climate change perspectives into green skills and vocational education programmes.

RECOMMENDATION 6
Empower teachers with comprehensive climate change education training and resources.

RECOMMENDATION 7
Engage with the youth to build a green future.

RECOMMENDATION 8
Incorporate local and traditional knowledge that supports low-carbon lifestyles in climate change education.

RECOMMENDATION 9
Promote partnerships to foster innovations in climate change education.

RECOMMENDATION 10
Strengthen and create education-centred portals to provide reliable information on climate change.





CHAPTER 1

About the report

This chapter offers a brief introduction to the context of this report, as well as its purpose, aim, scope, methodology and structure.

Left: Students participate in de-weeding activities in their school premises. Government High School, Tamil Nadu.



About the report

Context

Since 2019 and as part of its mandate to support South Asian Member States in the development of robust, evidence-based policies in the field of education, the UNESCO Multisectoral Regional Office in New Delhi has published an annual State of the Education Report (SoER) for India. Each year, the report focuses on a specific theme relevant to the Indian educational context, with in-depth analysis and data-driven examples and recommendations towards making the education system more holistic, effective and transformative.

The four annual State of the Education Reports for India published so far have focused on the right to education of children with disabilities (titled *N for Nose*, 2019); Technical and Vocational Education and Training (*Vocational Education First*, 2020); teachers' work and their professional development (*No Teacher, No Class*, 2021); and Artificial Intelligence in education (*Here, There and Everywhere*, 2022). Given the urgency of the climate crisis and the rapid developments in the education and climate change sectors, the 2023 edition of the SoER for India is focused on education to address climate change.

The issue of addressing climate change is increasingly acknowledged as a crucial point for achieving the United Nations' 2030 Agenda for Sustainable Development. The United Nations Secretary-General, António Guterres, has called the global climate and environmental crisis the 'battle of our lives', and has urged for greater urgency, stronger action and effective accountability to respond to this shared problem.¹ Each year, in the context of international efforts to combat climate change, a conference of all Member States that are parties to the United Nations Framework Convention on Climate Change (UNFCCC) is organized to review the effective implementation of the Convention. These Conference of the Parties (COP) meetings serve as crucial forums for setting targets, sharing knowledge and fostering international cooperation to mitigate greenhouse gas emissions and adapt to the impacts of a changing climate. Moreover, as the apex decision-making body of the UNFCCC, COP meetings assess progress made in achieving the ultimate objective of the Convention, which is to prevent dangerous human interference with the climate system.²

Below: Learning early: planting seeds in a school kitchen garden. Keircombai School, Tamil Nadu.





Right: Through games like the Web of Life, children learn about the interconnectedness of the environment. Rachna School, Gujarat.

4
pillars of
transformative
education

At the international level, India has consistently demonstrated its commitment towards addressing the issue of climate change. At COP26 in 2021, India announced its 'Panchamrit'³ commitments and 'Mission Life'⁴, and in the following year, India announced a long-term low-carbon development strategy at COP27. More recently, India has prioritized transformative actions for a cleaner, greener and bluer future through its 2023 Presidency of the G20 and many of these initiatives are explored in greater detail in this report.

While climate change remains at the core of discussions during these global meetings, this report underscores the significance of integrating education as a powerful tool to address climate-related issues, emphasizing the mutual benefit of collaboration between the education and climate change and environment sectors. Education is an essential strategic element of the global response to climate change as it helps learners understand the causes and consequences of climate change and fosters the acquisition of skills, behaviours and dispositions that individuals and communities need to achieve low-carbon and climate-resilient development (UNESCO, 2013).

While harnessing the critical role of education to address the climate crisis, the Greening Education Partnership (GEP) was launched at the United Nations' Transforming Education Summit in September 2022 as a collaborative platform for governments and stakeholders to deliver coordinated and comprehensive action. The GEP aims to forge a strong multistakeholder alliance by providing expertise, resources and diverse solutions to prepare every learner to acquire the knowledge, skills, values and attitudes to tackle climate change and promote sustainable development. Using a whole-system approach, the GEP is structured around four key pillars of transformative education.



1 Greening schools

Schemes, programmes and initiatives around green, climate-safe and resilient schools



2 Greening curriculum

Policies, content, pedagogies, skills and competencies, and assessment



3 Greening teacher training and education systems' capacities

Capacity-building of teachers, school leaders and education stakeholders, teaching resources and aids



4 Greening communities

Engaging communities in climate education and awareness

The 2023 State of the Education Report for India will analyse various aspects of climate change education in India from the perspective of these four pillars.

¹ <https://www.un.org/sg/en/content/sg/speeches/2022-11-07/secretary-generals-remarks-high-level-opening-of-cop27>

² <https://unfccc.int/process/bodies/supreme-bodies/conference-of-the-parties-cop>

³ India presented five 'nectar elements' (Panchamrit) of climate action to the world during COP26 in Glasgow in 2021, which included India's commitment to achieve net zero emissions by 2070.

⁴ Mission LIFE is a global mass movement to promote healthy and sustainable lifestyles based on Indian traditions of mindful resource utilization, conservation and respect for nature.



India is committed to transitioning towards a low-carbon and circular economy as an integral part of its developmental trajectory.



Purpose, aim and scope

In India, the education sector is being reformed through the National Education Policy 2020 (MoE, 2020), as well as through the revision of the National Curriculum Framework for School Education 2023 (NCERT, 2023). With the support of such reforms, climate change and education are undergoing significant changes at the national level, particularly in terms of policy paradigms.



This report analyses how education on climate change is being integrated in India's national policies and education system through stage-wise curricula, effective pedagogies, teachers' training, teaching resources and green skilling.

Starting with a comprehensive assessment of the contextual background of climate change in India, its impact on education and the role of education in addressing this critical issue, this report analyses how education on climate change is being integrated in India's national policies and education system through stage-wise curricula, effective pedagogies, teachers' training, teaching resources and green skilling.

In the sphere of international cooperation, India is committed to transitioning towards a low-carbon and circular economy as an integral part of its developmental trajectory. As India is a signatory to the 2015 Paris Agreement on

Climate Change, this report explores India's efforts and achievements against climate change with specific focus on Action for Climate Empowerment (ACE), notably work under Article 12 of the Agreement to educate, empower and engage all stakeholders on climate action.

Inspiring initiatives, innovative practices and thought-provoking case studies on how different stakeholders approach education to address climate change in India are also showcased throughout this report. Such examples of concrete climate action and engagement include the importance of promoting traditional practices, adopting climate-friendly lifestyles, and imparting green skills through education.

The 2023 SoER also presents a thorough examination of the gaps, challenges and future opportunities for climate change integration and implementation in education, including for non-formal education, as well as observations, concerns and demands of students, the youth and teachers on the quality of available climate change education.

Finally, this report offers ten concrete policy recommendations to support education systems become climate-smart and crisis-resilient, and to equip learners with the knowledge, skills and attitudes to empower them to make eco-conscious choices and take positive action against climate change.

Methodology

This report is enriched with many sources of knowledge and information, including the experience and expertise of partner institutions, extensive secondary research, interviews with experts and quantitative statistics from secondary sources. By using these diverse sources, this report offers well-rounded, inclusive and evidence-based insights on different aspects of climate education in India. The secondary sources of data used in this report are from:

- Government of India and state government websites of relevant departments and organizations; government surveys, portals, dashboards and platforms on education; press releases.
- Policy documents, official reports, plans and documents of central and state governments.

- Various reports published by UN bodies, specifically UNESCO, UNICEF and UNFCCC, and by other international / intergovernmental organizations such as the Intergovernmental Panel on Climate Change (IPCC).
- Published journal articles, news articles and research papers.
- Reports published by expert organizations, available online.
- Websites and web documents from reputed organizations including non-governmental organizations.

Throughout the process, considerations of responsible research practices, including informed consent, authentic information, referencing and citations, were taken into account.

Left: Curious minds: a young child exploring nature. The Planet Discovery Centre, CEE, Gujarat.



Above: Learning about clean and renewable energy in different local contexts. Gujarat Science City, Gujarat.

Structure

This chapter provides an overview of this report's context, purpose, aim and scope. It also outlines the methodology used in this report and its structure. The remaining six chapters are outlined below:

CHAPTER 2 **Introduction**

This chapter gives a brief account of the effects of climate change in India and on its education sector, moving on to an account of India's global commitments to climate change, as a signatory to the Paris Agreement, and to quality education under the United Nations' 2030 Agenda for Sustainable Development. It explores India's policies related to these commitments, while also exploring how the education and climate change sectors are interlinked. The journey of environment education in India is outlined, with

climate change as an integral subset, up to the recent thrust on climate change education via the National Education Policy 2020 and the National Curriculum Framework 2023. The chapter also covers the context and relevance of addressing climate change through education in India and ends with a compilation of UNESCO's initiatives on Education for Sustainable Development (ESD).

CHAPTER 3 **Climate change education in India**

This chapter presents the status of climate change education in India through an analysis of policies, curriculum integration (from foundational to higher education), pedagogies and teachers' training initiatives. It highlights

policy initiatives in India related to the six elements of Action for Climate Empowerment, working towards disseminating climate change education, information and awareness, and underscores the need for and ongoing efforts towards climate-ready schools and inclusion of disaster preparedness in education. It also presents initiatives and case studies on climate change education around the four pillars of the Greening Education Partnership – greening schools, greening curriculum, greening capacities and greening communities.

CHAPTER 4

Challenges for India

This chapter discusses the challenges faced by climate change education in India on account of gaps in policies and in the education system's capacity on various fronts.

CHAPTER 5

Opportunities for India

To address the challenges in climate change education, this chapter explores opportunities to mainstream climate change into formal

education as offered by the National Education Policy 2020 and revisions in the National Curriculum Framework, by training and empowering young people and communities on green skills, and by strengthening multistakeholder collaborations through the Greening Education Partnership.

CHAPTER 6

Conclusions and way forward

This chapter highlights key learnings and findings from the analyses in the previous chapters, and discusses the way forward for addressing climate change education and getting every learner climate-ready.

CHAPTER 7

Recommendations

This chapter offers ten concrete recommendations to education stakeholders, including policy-makers, practitioners, educational institutions (including heads, teachers and management), young people and communities, to strengthen climate change education in India.



Right: A worksheet activity to distinguish between renewable energy sources and fossil fuels. Keircombai School, Tamil Nadu.

SAVE
ENERGY

Swap
books

Let's
Carpool





CHAPTER 2

Introduction

This chapter critically engages with global debates between development and climate change. It delves into India's commitment to both climate action and sustainable development, and examines India's climate policies, achievements, and the context of climate change education within the country, explaining the process of mainstreaming climate education in India's educational landscape. The Greening Education Partnership is also introduced.

Left: Learning at the foundational stage: young children taught sustainable ways of living. The Planet Discovery Centre, CEE, Gujarat.



Introduction

Adopted by 193 countries in 2015, the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) provide a shared blueprint for peace and prosperity for people and the planet. While each of the 17 goals have their own sets of targets and indicators, they are interdependent and interconnected, and progress towards one goal impacts advancement towards others. For instance, addressing climate change (Goal 13) requires efforts towards sustainable cities and communities (Goal 11), affordable and clean energy (Goal 7), responsible consumption and production (Goal 12), conserving life below water and on land (Goals 14 and 15) and education on climate change (Goal 4).

This report focuses on the intersection of SDG 4 (Quality Education) and SDG 13 (Climate Action) within the Indian context, and analyses

India's education initiatives towards SDG 4.7 (Education for Sustainable Development [ESD]) and SDG 13.3 (improving education, awareness-raising and human and institutional capacity on climate change). This report highlights how these two elements of sustainable development come together and work in synergy through policies, initiatives and actions to address climate change through education. Moreover, this report demonstrates how integrated and holistic climate education can amplify climate actions and how climate actions in schools, educational institutions and communities can reduce the vulnerability of education systems and society.

Along these lines, this report also discusses the current challenges and opportunities that lie in education to address climate change.

FIGURE 1
The 17 Sustainable Development Goals



This report focuses on the intersection of SDG 4 (Quality Education) and SDG 13 (Climate Action) within the Indian context.

Source: <https://sdgs.un.org/goals>



Above: Students brainstorm ways to reduce carbon footprints in a fun drawing activity. Rachna School, Gujarat.

Global debate on development versus climate change

This section delves briefly into India's role in historical emissions, its early efforts in pioneering environmental education and its current mainstreaming of climate change education. Taken together, this presents a picture of India's sensitivity to issues of environmental protection, resource conservation and climate actions, as well as India's intention of infusing environmental stewardship among students and young people in terms of both learning and practice.

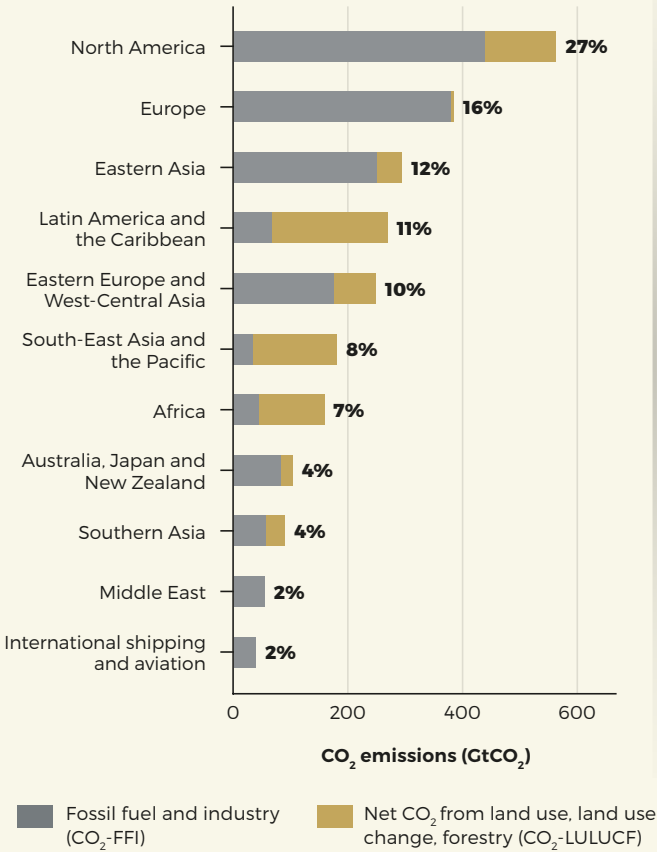
The composition of atmospheric carbon dioxide (CO₂) at the beginning of the Industrial Revolution (around 250 years ago) was 280 parts per million (ppm). Today, it has reached 410 ppm, with substantial implications for the climate (IPCC, 2021b). During this time, a chain of global events shaped the course of humanity: the Industrial Revolution that brought the world immense economic growth and development; two World Wars; decolonization and independence movements in Asia and

the Pacific, Africa, Latin America and the Caribbean; space exploration; liberalization and globalization, which opened up economies and international trade; and, more recently, the information and digital revolutions. In all these global developments, environment conservation and sustainability did not receive much importance and attention. The rapid development of the now fully industrialized and high-income countries was essentially underpinned by fossil fuels, which led to dramatic alterations in the chemical composition of the global atmosphere.¹

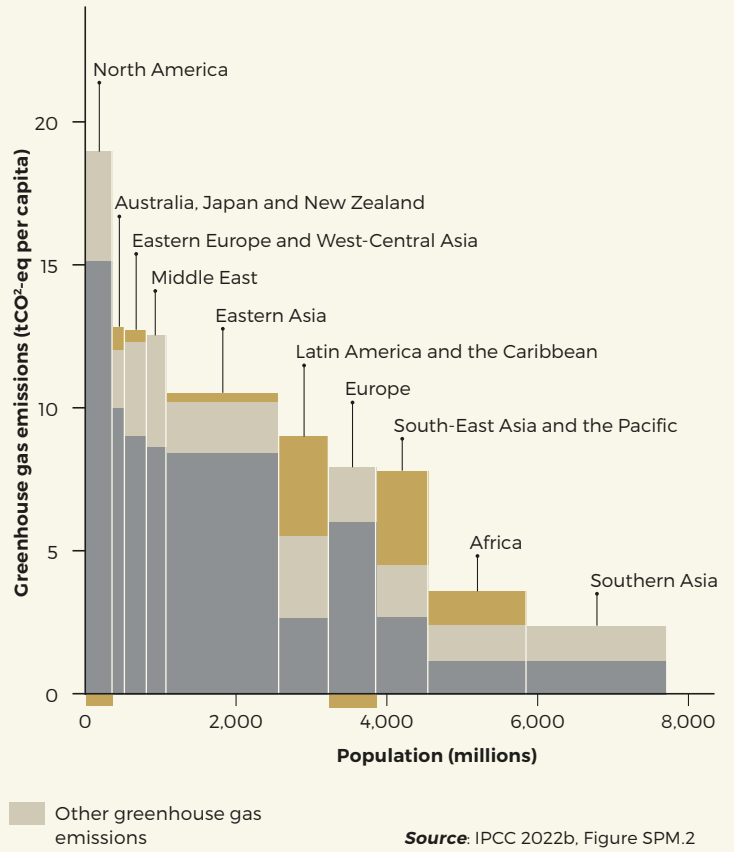
¹ Before the Industrial Revolution, the annual average concentration of carbon dioxide (CO₂) was consistent at around 280 ppm for almost 6,000 years of human civilization. Since then, humans have generated an estimated 1.5 trillion tons of CO₂ pollution, much of which will continue to warm the atmosphere for thousands of years (NOAA, 2022). The current average annual concentration of CO₂ has increased to 410 (IPCC, 2021b) and was 417.2 ppm in 2022 (Met Office, 2022).

FIGURE 2
Region-wise global cumulative and per-capita emissions as per the IPCC's Sixth Assessment Report (AR6)

PANEL A
Historical cumulative net anthropogenic CO₂ emissions per region (1850-2019)



PANEL B
Net anthropogenic greenhouse gas emissions per capita and for total population, per region (2019)



Source: IPCC 2022b, Figure SPM.2

It is vital to note that all countries have a right to an equitable and fair share of the global carbon budget, which they must use responsibly. In simplified terms, a carbon budget is the cumulative amount of carbon dioxide emissions permitted over a period of time to keep within a certain temperature threshold. However, Figure 2 highlights how greenhouse gas emissions have been distributed unevenly across different regions of the world, cumulatively, from 1850 to 2019 (IPCC, 2022b). Panel A of Figure 2 shows clearly that all of Southern Asia (including India)

contributed only about 4 per cent of historical cumulative emissions between 1850 and 2019, even though the region includes almost 24 per cent of the global population. Emissions from developed and high-income regions have been significantly higher, despite a much lower share of the global population.

Panel B shows how per capita net greenhouse gas emissions varied from 2.6 tCO₂ to 19 tCO₂, while the global average was 7.8 tCO₂-eq. In Southern Asia, including India, the per capita CO₂ FFI (fossil fuel and industry) emission was 1.7 tonnes, significantly

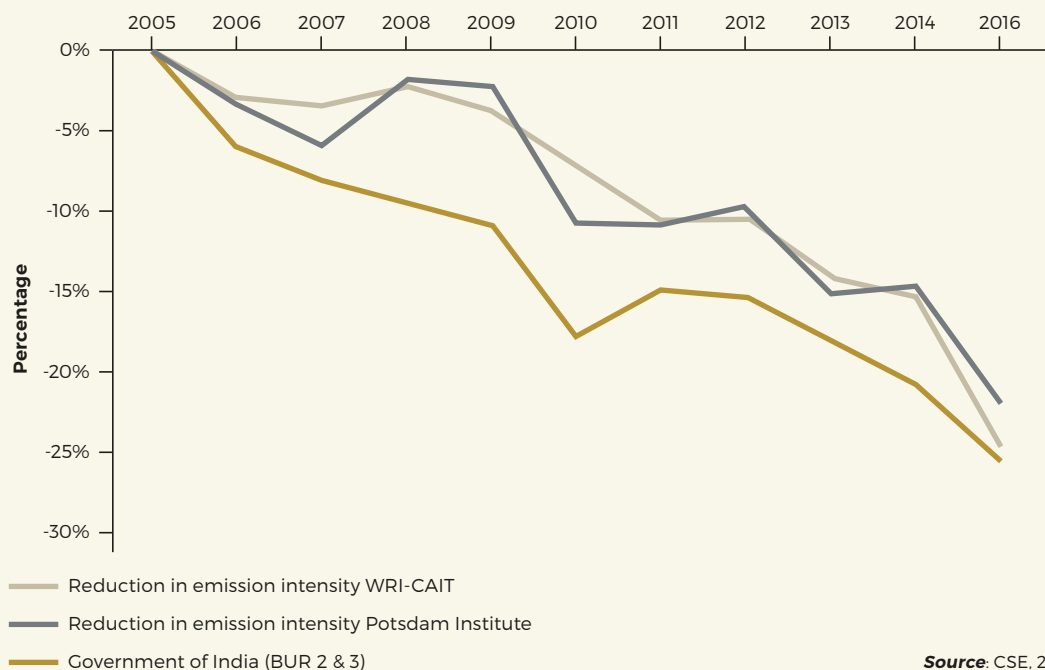
It is vital to note that all countries have a right to an equitable and fair share of the global carbon budget, which they must use responsibly.

TABLE 1
Year of reaching net zero by utilizing fair share of remaining carbon budget

	1.5 °C (67% probability)	1.5 °C (50% probability)	2 °C (67% probability)	2 °C (50% probability)
World	2030	2037	2062	2076
Annex-I group	2025	2028	2040	2047
Non-Annex-I group	2034	2042	2074	2091

Source: MSSRF and NIAS, 2022

FIGURE 3
India's emission intensity reduction since 2005



The emissions intensity of India's gross domestic product (GDP) has been reducing consistently since the base year of 2005.

lower than the world average (6.6 tonnes CO₂-eq. per capita).

Table 1 shows that for a 50 per cent probability of limiting temperature rise to 1.5 °C by staying within its fair share of the remaining carbon budget, the world will have to reach net zero by 2037. Annex-I countries (industrialized countries and economies in transition) will have to become net zero much earlier, by 2028, than Non-Annex-I countries, by 2042.² For a 50 per cent probability of limiting temperature rise to 2 °C by staying within its fair share of the remaining carbon budget, Annex I countries will have to reach net zero by 2047 and Non-Annex-I countries by 2091. Current net zero commitments of most Annex-I countries fall short of their fair share of the carbon budget to stay within 1.5 °C or even 2 °C.

When much of the western world was developing, environmental impacts were not a concern and the consequences of their actions were not known. However, as the world started witnessing environmental impacts and climate crises far and wide, it began uniting to protect

the environment and combat climate change.

Today, emerging economies like India face the dual challenge of ensuring rapid development while being responsible people of the planet.

To stay within the environmental safety threshold, India has to develop in a 'leapfrog' manner, not by imitating previous ways of development but rather innovating and adopting economy-wide strategies of sustainability to achieve rapid development. With the synergies in governance, multistakeholder partnerships and effective implementation, India has been working in this direction. The emissions intensity of India's gross domestic product (GDP) has been reducing consistently since the base year of 2005 (Figure 3). As per an assessment by the International Energy Agency, the CO₂ emission intensity of India's GDP went down from 0.31 tCO₂ per USD 1,000 to 0.26 tCO₂ per USD 1,000 between 2005 and 2020 (IEA, 2022). Thus, in the ongoing global debate on development versus climate change, it is clear that it is imperative to find sustainable solutions that balance economic progress with environmental preservation for the well-being of present and future generations.

² <https://unfccc.int/parties-observers>



Right: Community members engage in a discussion about deforestation and changing climate patterns. Ambedkar Nagar, Tamil Nadu.

India and climate change

India's unique tropical and subtropical location, vast geographic scale and varied topography provide for rich climatic, species and ecosystem diversity. India is one of the world's 17 mega-diverse countries,³ inhabited by 7 per cent to 8 per cent of the world's recorded species,⁴ many of which are endemic⁵ to the country.

India has five major forest types, eleven distinct biogeographic zones and fifteen agro-climatic zones. India's forests are teeming with wildlife. They support about 70 per cent of the global tiger population, about 60 per cent of Asian elephants, approximately 80 per cent of one-horned rhinoceroses and 100 per cent of the world's Asiatic lions (Government of India, 2022b). The Himalayas, Trans-Himalayas, Thar Desert, Gangetic Plains, Western Ghats, Deccan Plateau, Eastern Ghats, coastal regions and islands contribute to India's rich natural heritage and natural resources, and are living examples of India's diversity and culture of living in harmony with nature.

This extraordinary variety of climatic regions not only shapes India's diverse natural ecosystems, water resources and agriculture, but also influences the country's rich sociocultural diversity. Moreover, this variety of climatic regions provides a wealth of economic opportunities, livelihoods and innumerable ecosystem services for the overall well-being of society.

The monsoon is the defining season of India's climate, and India's monsoon season is one of the world's most productive wet seasons as it supplies over 80 per cent of the country's annual rainfall (Collier and Webb, 2002). Owing to India's diverse and favourable agro-climatic conditions, the nation's 170 million hectares of cropland area is the largest in the world (FAO, 2020), making India one of the world's leading agricultural producers.⁶ India also has the largest population of natural-resource-dependent communities that have agricultural, fisheries-, animal-husbandry- and forest-based livelihoods, constituting more than 60 per cent of its population.

³ The 17 megadiverse countries of the world account for 70 per cent of the world's biodiversity.

⁴ With 101,167 species of animals recorded in India, it is home to 6.7 per cent of the world's faunal species. With 47,485 species of plants, India accounts for 11.2 per cent of all plant species recorded on earth (MoEFCC, 2019) and 7 per cent of the world's flowering plant species (angiosperms) (BSI ENVIS, 2022).

⁵ Endemic species are those that are found in just one region and nowhere else in the world. In India, 10.53 per cent of mammals, 6.04 per cent of birds, 37.3 per cent of reptiles, 69.32 per cent of amphibians and 28.2 per cent of plants are endemic (MoEFCC, 2019). Some of India's endemic species include the Asiatic lion, Nilgiri tahr, Malabar grey hornbill, purple frog, Kashmir stag, etc.

⁶ India is the largest producer of milk, pulses, sugar cane and jute, and second largest producer of rice, wheat, groundnut, vegetables, fruit and cotton. It is also one of the leading producers of spices, fish, poultry and plantation crops.

School Bhuvan

Greening curriculum

School Bhuvan is a portal that provides map-based learning to make students aware of India's natural resources and environment, and their role in sustainable development.

School Bhuvan is an initiative of Bhuvan, developed by the National Remote Sensing Centre (NRSC) of the Indian Space Research Organisation (ISRO), and is based on the National Council of Educational Research and Training (NCERT) syllabus.

For more information see: https://bhuvan-app1.nrsc.gov.in/mhrd_ncert/sb/sb.php#school:NINTH



India was the 7th most affected country in the world due to climate change in 2019, as per the latest Global Climate Risk Index 2021.

The Intergovernmental Panel on Climate Change (IPCC) has underscored the interdependence of climate, ecosystems and biodiversity and human societies in its assessments. The IPCC has also stated that human-induced climate change, including more frequent and intense extreme events beyond natural climate variability, has caused widespread adverse impacts and related losses and damage to nature and people (IPCC, 2022a). Even though climate change is a global phenomenon, IPCC assessments show that its impacts differ across regions, sectors and communities.

On account of the changing climate, the different regions of India are facing distinct climate hazards, such as floods, cyclones, droughts, heatwaves, coastal inundation, forest fires, landslides and glacial melting. This impacts the country's natural ecosystems and biodiversity, and affects large populations that live in regions exposed to climate hazards and depend on climate-exposed sectors for their sustenance and livelihood.

India was the 7th most affected country in the world due to climate change in 2019, as per the latest Global Climate Risk Index 2021 (Eckstein et al., 2021).

In 2019, India recorded the highest number of fatalities (2,267) and highest absolute loss (US\$68.8 million) caused by an intense monsoon season that brought 110 per cent of normal rainfall and 8 tropical cyclones, including Cyclone Fani (Eckstein et al., 2021).

The report also finds that though there are some countries more vulnerable to climate change than India, the absolute loss and damage due to climate change is the highest in India. Overall, climate-induced disasters have affected over 40 million people in India, causing total economic losses of US\$10 billion (Eckstein et al., 2021). In 2021, India suffered a total loss of US\$3.2 billion from heavy rains and flash floods during the monsoon season, resulting in about 1,300 casualties and great damage to crops and property. In 2022, Assam saw droughts and floods within the span of a week while climate disasters claimed more than 3,000 lives, affected 1.96 million hectares of crop area, destroyed over 423,000 houses and killed close to 70,000 livestock across India (Sengupta, 2023). These examples emphasize the unprecedented nature of climate change and its significant impact on both the environment and society as a whole.

For developing countries, especially India, which houses roughly one-sixth of humanity, adaptation

to climate change is an overwhelming concern. The United Nations Framework Convention on Climate Change (UNFCCC) acknowledges this reality for all developing countries for meeting their social and developmental needs. India ranks 129th in the world based on average cumulative per capita carbon dioxide emissions, 7th based on cumulative historical carbon dioxide emissions from 1850-2020, and 4th if the ranking is based on current annual emissions (Bhatt, 2023). The United Nations Environment Programme (UNEP) Adaptation Gap Report 2022 notes that:



US\$160 to US\$340 billion

will be needed by developing countries by 2030, and



US\$315 to US\$565 billion

will be needed by developing countries by 2050 to fund their adaptation costs and needs (UNEP, 2022).

Climate change is impacting agriculture in India by increasing the risk of crop failures and reducing overall crop yield and their nutritional quality. Analysing the trend of rising temperatures and declining rainfall in India from 1970 to 2015, the Economic Survey 2018-19 observed that a decline in annual rainfall of 100 mm below average reduces a farmer's income by 15 per cent during the kharif season, 7 per cent during the rabi season and by as much as 20 per cent to 25 per cent in unirrigated areas (Government of India, 2019; Lahiry, 2018). A World Bank study projects intensification of climate extremes in India, with increased drought risk and increased quantity of precipitation during heavy rainfall (World Bank Group, 2021). Current average availability of freshwater is expected to be further adversely affected by climate variability and change (Bassi, 2022).

The IPCC's sixth Assessment Report (Working Group II) (IPCC, 2022a) also projects severe consequences of climate change for the Indian subcontinent, with increased dry spells, intensification of extreme rainfall by over 20 per cent, and an exponential surge in heatwaves and cyclonic events. As per one assessment of India's climate vulnerability, five out of twenty Indians are highly vulnerable to extreme hydrometeorological (or hydromet) disasters like floods, droughts and cyclones, and over 80 per cent of India's population lives in vulnerable districts (Mohanty and Wadhawan, 2021). Without adaptation measures, extreme river floods are expected to affect an additional 13 million to 34 million people every year by the 2040s and coastal flooding is expected to affect an additional 5 million to 18 million people every year by the 2070s until the end of the century (World Bank Group, 2021).

India's commitment to climate action and sustainable development



India is actively adopting sustainable transitions to renewable energy and promoting environmentally conscious lifestyles.

India has actively participated in and contributed to international efforts combating climate change, including at the 1972 United Nations Conference on Human Environment in Stockholm, which marked the beginning of global discussions and agreements on environmental concerns. At the conference, India's Prime Minister, Indira Gandhi, raised serious concerns about the consequences of exploitative development on natural resources, environmental pollution and poverty, and underlined interlinkages between the environment and development. Her visionary speech reflected the concerns of the Global South and the urgent need for a global environmental policy (Mathiesen, 2014).

Twenty years later, at the Rio Earth Summit in 1992, many countries came together to agree on the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD). The Rio summit also led to the creation of the UN Commission on Sustainable Development (CSD).

These agreements form the basis of current international cooperation on environmental issues.

India has been a part of these international conferences and made its interventions in each of them, reflecting India's policy of socioeconomic development alongside environmental protection and global cooperation. It ratified all the three conventions originating from the Rio Summit: the UNFCCC, the UNCCD and the CBD (also known as UN Biodiversity).

As a State Party to the UNFCCC, India ratified the Kyoto Protocol in 2002 and the Paris Agreement in 2015. Under the Kyoto Protocol, India is the second largest host of Clean Development Mechanism (CDM) projects (1,685 projects and 161.3 million Certified Emission Reductions [CERs] as of March 2022 [Muthyanolla, 2022]). India also launched a National Green Hydrogen Mission in January 2023, as a step towards achieving its climate commitments (MNRE, 2023).

India is actively adopting sustainable transitions to renewable energy and promoting environmentally conscious lifestyles. During the twenty-sixth session of the Conference of Parties (COP26), the Prime Minister of India, Narendra Modi, launched Mission LiFE, an initiative that seeks to mobilize individuals and communities toward a worldwide movement focused on fostering positive behavioural changes to protect the environment.

Below: Looking after the school's kitchen garden is made part of the daily routine. Smt. M. A. Jani Jivan Shala, Gujarat.



Mission LiFE - India-led global mass movement to combat climate change



Mission LiFE (Lifestyle for Environment) is a global movement promoting sustainable lifestyles and mindful use of resources to conserve the environment. Recognizing that lifestyle plays a key role in climate change, Prime Minister Narendra Modi put forward the idea of LiFE at COP26 in 2021 and launched it globally on 22 October 2022 in the presence of UN Secretary-General António Guterres at the Statue of Unity, Gujarat.

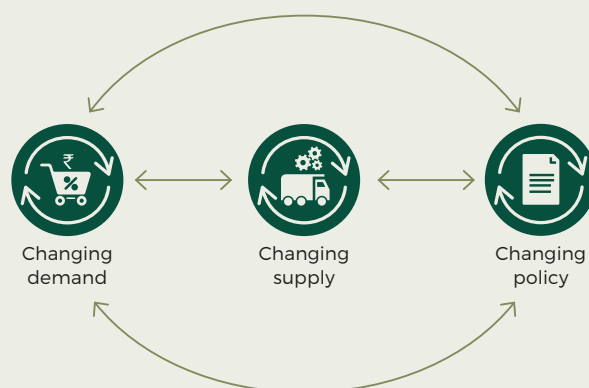
Mission LiFE has also been included as part of India's updated first Nationally Determined Contribution under the Paris Agreement (2021-2030), whereby India commits to promoting and further propagating a healthy and sustainable way of living based on traditions and values of conservation and moderation as key to combating climate change (Government of India, 2022a). In May 2023, India's Ministry of Environment, Forest and Climate Change (MoEFCC) launched a mobile app called Meri LiFE, which encourages individuals to take five actions to combat climate change by uploading a picture of the task, writing a caption and sharing it with friends and family.

Climate change extends beyond policy-making and needs individuals, families and communities to do their part to bring about behavioural changes that can contribute to reducing emissions significantly. Consequently, the mission has an ambitious target of mobilizing 1 billion individuals to adopt sustainable lifestyles in a period of 5 years from 2022 to 2027, and making 80 per cent of all villages and urban local bodies environment-friendly by 2028.

Mission LiFE envisions three fundamental transformations in our collective approach to sustainability:

- 1 Change in demand (Phase I) - nudge individuals towards environment-friendly actions in daily life.
- 2 Change in supply (Phase II) - gradually nudge industries and markets to respond to revised (sustainable) demands.
- 3 Change in policy (Phase III) - trigger shifts in large-scale industrial and government policies to support sustainable consumption and production.

FIGURE 4
Theory of change to promote sustainable actions by adopting sustainable lifestyles



The mission is incubated, curated and piloted by NITI Aayog and implemented by the MoEFCC in a non-linear and non-sequential manner. A dedicated Mission LiFE portal (<http://missionlife-moefcc.nic.in/>) hosted by the MoEFCC provides free access to creative video and information materials created for LiFE and allows involved ministries and agencies to upload event reports and track the progress of ongoing mass mobilization.

There are seven thematic areas across which sustainable lifestyle actions are promoted. As Mission LiFE was launched during the seventy-fifth year of India's independence, a comprehensive and non-exhaustive list of seventy-five actions has been made a part of the mission's actions, which are clubbed under seven action themes. The youth, students and communities are the major target groups for Mission LiFE activities.

FIGURE 5
The seven core thematic areas of LiFE actions





India's climate change performance ranks eighth in an analysis of fifty-nine countries plus the European Union.

As one of the world's fastest growing economies in 2023 (OECD, 2023a), India has also committed to undertaking sustainable and low-emission development in pursuit of its Nationally Determined Contributions (NDCs) and long-term goal of achieving net zero by 2070. On account of its high vulnerability to climate change (University of Notre Dame, 2021 and Eckstein et al., 2021), building resilience across different sectors, regions and communities is on India's agenda for sustainable and inclusive development.

India has also launched and is leading important global partnerships for climate action – the International Solar Alliance (ISA) launched in 2016 and the Coalition for Disaster Resilient Infrastructure (CDRI) launched in 2019. India expressed its intention to intensify its climate action by presenting five nectar elements ('Panchamrit') of climate action to the world at COP26 in Glasgow in 2021, which included India's commitment to achieving net zero emissions by 2070.

India has made significant progress towards meeting its emissions reduction targets as per

its NDCs under the Paris Agreement. It has progressively decoupled economic growth from greenhouse gas emissions (MoEFCC, 2021) and the emissions intensity of its gross domestic product has reduced by 33 per cent between 2005 and 2019 (EuronewsGreen, 2023).

Notably, according to the 2023 Climate Change Performance Index, India stands eighth in the analysis⁷ of fifty-nine countries plus the European Union that produce 92 per cent of global greenhouse gas emissions (Burck et al., 2022). The International Monetary Fund (IMF) estimates that while a modest increase in its short-term emissions may be necessary to meet India's poverty reduction and energy security goals, a more rapid scaling up of current policies could help lower its emissions considerably over the medium term and bring India closer to a path to net zero by 2070 (MacDonald and Spray, 2023).

⁷ The scores are an aggregation of five indicators including greenhouse gas emissions, renewable energy, energy use and climate policies.

India's updated Nationally Determined Contributions

India communicated its updated NDCs to the UNFCCC in August 2022. India committed to an ambitious target and significant contribution to achieving the goals of the Paris Agreement (Government of India, 2022a). India's updated NDC targets include:

- Reduce emissions intensity of India's GDP by 45 per cent from 2005 levels by 2030.
- Achieve 50 per cent of cumulative electric power installed capacity from non-fossil-fuel-based resources by 2030, with the help of transfer of technology and low-cost international finance including the Green Climate Fund (GCF).
- Create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through additional forest and tree cover.
- Put forward and further propagate Lifestyle for Environment (LiFE) – a healthy and sustainable way of living based on traditions and values of conservation and moderation as a key to combating climate change.
- Adopt a climate-friendly and cleaner path than the one followed hitherto by others at corresponding levels of economic development.
- Better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, the Himalayan region, coastal regions, health and disaster management.
- Mobilize domestic and new and additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resources required and the resource gap.
- Build capacities, create domestic frameworks and international architecture for quick diffusion of cutting-edge climate technology in India and for joint collaborative research and development for future such technologies.

Together with mitigating climate change, India also focuses on adaptation, owing to its high climate vulnerability. Additionally, the country aims to enhance investments in development programmes focused on sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan regions, coastal regions, and health and disaster management, to improve their ability to adapt to climate challenges. Some schemes and programmes in this direction include the National Adaptation Fund for Climate Change (NAFCC), National Mission for Sustainable Agriculture (NMSA), National Mission for Sustaining the Himalayan

Ecosystem (NMSHE), National Water Mission, National Mission on Sustainable Habitat, National Mission on Strategic Knowledge for Climate Change (NMSKCC), etc.



As part of Article 6 of the UNFCCC, India is also working on promoting education about, training on and public awareness of climate change. It is making various efforts to educate, empower and engage all stakeholders to understand climate change and its implications, and find and implement solutions for climate change. We examine these efforts in detail in later chapters of this report.

Linkages between SDG 4 and SDG 13

The 2030 Agenda for Sustainable Development was adopted globally at the United Nations Sustainable Development Summit in 2015. It includes 17 Sustainable Development Goals (SDGs) and 169 associated targets to end poverty, fight inequality and injustice and tackle climate change by 2030. These SDGs are more exhaustive than the 8 Millennium Development Goals that they replaced.

SDG 4 (Quality Education) includes a target for Education for Sustainable Development (ESD; SDG 4.7); while SDG 13 (Climate Action) has a target for education, awareness and capacity-building on climate change (SDG 13.3), which highlights that the achievement of one target feeds into the progress of others, signifying the strong correlation and interconnection between education and climate change. Table 2 further explains this phenomenon.

TABLE 2
Interconnections between targets 4.7 and 13.3 of the SDGs

	<p>Quality Education</p>	<p>Target 4.7</p> <p>By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through Education for Sustainable Development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development</p>	<p>Connection with climate change</p> <p>This target includes Education for Sustainable Development, of which climate change education is an important part.</p> <p>It also talks about sustainable lifestyles and culture's contribution to sustainable development – which are two important climate actions that India is strongly propagating through Mission LiFE (see Case Study 1)</p>
	<p>Climate Action</p>	<p>Target 13.3</p> <p>Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p>	<p>Connection with education</p> <p>This target includes three important aspects of empowerment – education, awareness and capacity-building – for promoting climate action</p>

Source: The Global Goals, 2023 and CEE research team

Climate change policies and achievements in India

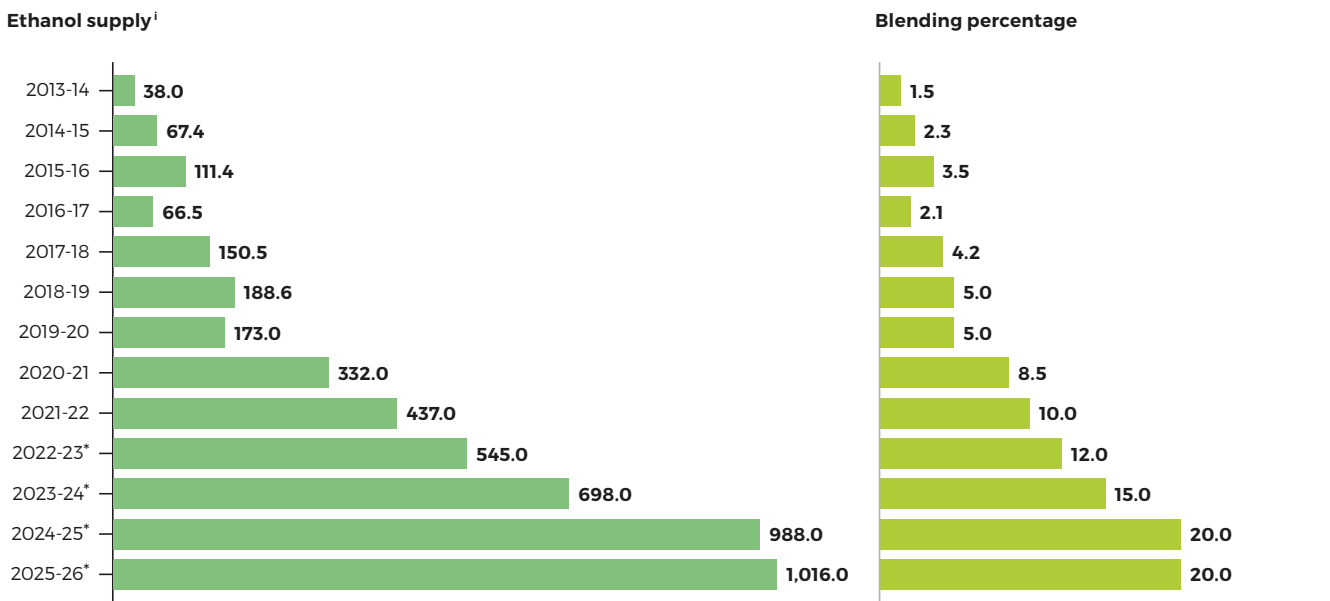
Ethanol blending

India’s Ethanol Blended Petrol Programme aims to increase the use of renewable and environment-friendly fuels and reduce India’s dependence on imported fuel. It is in line with the National Policy on Biofuels and has set a target of 10 per cent ethanol blending by 2022 and 20 per cent blending by 2030.¹

The programme began in January 2003, when India allowed sale of 5 per cent ethanol blended petrol in nine states and

in its union territories. By June 2022, India had achieved its target ahead of schedule, with 10 per cent blending of ethanol with petrol, thus saving about INR 50,000 crores (US\$6.02 billion) in foreign exchange, reducing greenhouse gas emissions and providing an alternative source of income to farmers. India hopes to achieve 20 per cent ethanol blending by 2023 (after revising its target in 2022)² which will yield an estimated US\$4 billion in annual savings on import bills.³

FIGURE 6
Ethanol supply and blending percentage (2013-14 – 2025-26)



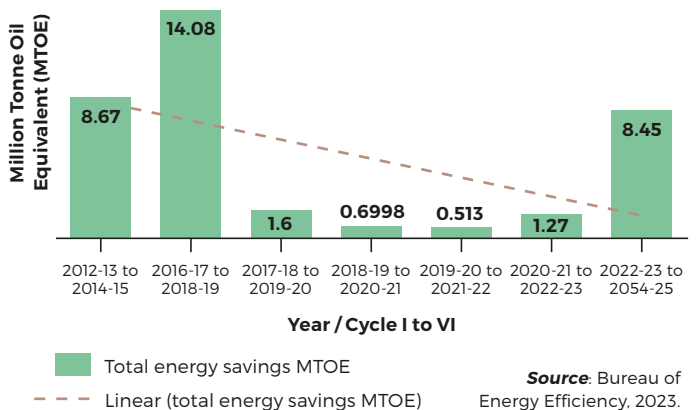
¹ In crore litres. 1 crore = 10 million; * Projected
The years are ethanol supply years (ESY), i.e. from 1 December of the first year to 30 November of the following year

Source: NITI Aayog and Ministry of Petroleum and Natural Gas, 2021

Perform, Achieve and Trade (PAT) status⁴

The National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight missions under the National Action Plan on Climate Change (NAPCC). Perform, Achieve and Trade (PAT) is the mission’s flagship programme, implemented by the Bureau of Energy Efficiency (BEE) under the aegis of the Ministry of Power. PAT aims to reduce Specific Energy Consumption (SEC), i.e. energy use per unit of production for Designated Consumers (DCs) in energy intensive sectors, with an associated market mechanism to enhance the cost effectiveness of excess energy saving through certification that can be traded.

FIGURE 7
Perform, Achieve and Trade (PAT) cycle



Source: Bureau of Energy Efficiency, 2023.

Renewable energy⁵

India targets to reduce the carbon intensity of its economy by 45 per cent by the end of the decade, achieving 50 per cent cumulative electric power installed from renewables by 2030, and to achieve net zero carbon emissions by 2070.

Currently, India is

4th
globally in
renewable energy
installed capacity

4th
in wind power
capacity

4th
in solar power
capacity

India's renewable energy generation

179.32 GW
as of July 2023

500 GW
by 2030

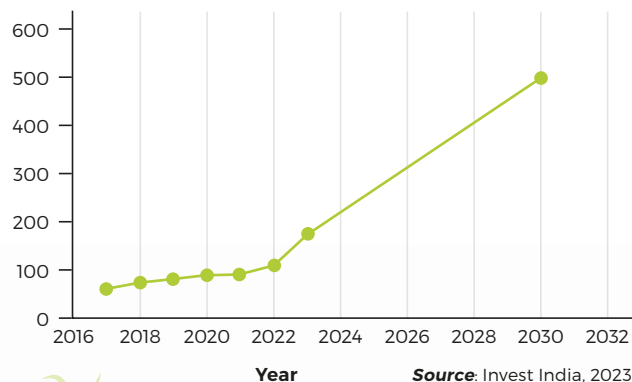
125 GW
from green
hydrogen by 2030



50 per cent cumulative
electric power
installed will be from
renewables by 2030



FIGURE 8
Installed renewable energy in India (GW)

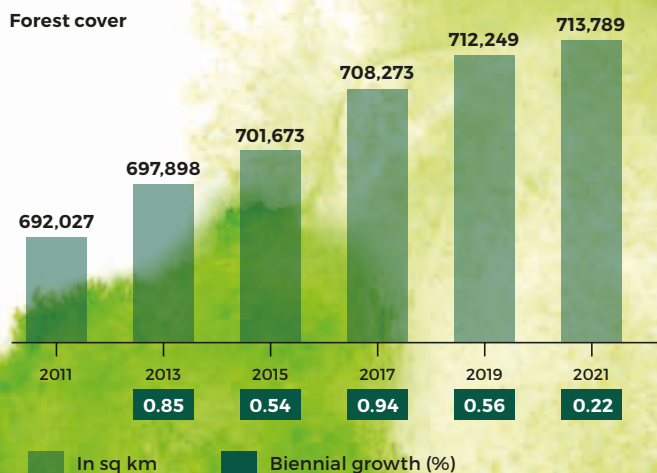


Forest and tree cover⁶

India's total forest cover in 2023 was **713,789** square kilometres, which is **21.71 per cent** of the country's total geographical area. India added 1,540 square kilometres of forest cover between 2019 and 2021.

FIGURE 9
Forest and tree cover in India (2011-2021)

Forest cover



Tree cover



¹ <https://www.livemint.com/economy/inside-the-growing-rift-in-ethanol-economy-11673371648125.html>

² <https://economictimes.indiatimes.com/industry/energy/oil-gas/india-achieved-10-pc-ethanol-blending-target-ahead-of-schedule-prime-minister-narendra-modi/articleshow/93566987.cms>

³ [https://economictimes.indiatimes.com/industry/energy/oil-gas/india-](https://economictimes.indiatimes.com/industry/energy/oil-gas/india-achieved-10-pc-ethanol-blending-target-ahead-of-schedule-prime-minister-narendra-modi/articleshow/93566987.cms)

[achieved-10-pc-ethanol-blending-target-ahead-of-schedule-prime-minister-narendra-modi/articleshow/93566987.cms](https://www.livemint.com/economy/inside-the-growing-rift-in-ethanol-economy-11673371648125.html)

⁴ <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1811051>

⁵ <https://www.investindia.gov.in/sector/renewable-energy>

⁶ <https://www.pib.gov.in/PressReleaseDetailm.aspx?PRID=1906388>

Background of education to address climate change in India



Climate change is the defining issue of our time, and we are at a defining moment. From shifting weather patterns that threaten food production to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Adapting to these impacts in the future will be more difficult and costlier without drastic action today.

Education is a critical agent in addressing the issue of climate change. It helps to understand and address the impacts of the climate crisis, empowering children and adults with the knowledge, skills, values and attitudes needed to act as agents of change.



Dr K. Kasturirangan

Chair, National Steering Committee for National Curriculum Framework, Government of India

The previous section outlined the context of climate change in India and established India's vulnerabilities, developmental priorities and commitments to mitigating climate change and to sustainable development. This section will examine the education sector in India, and its reciprocal relationship with climate change – both its vulnerability to climate change and its role in addressing climate change.

India has the largest education system in the world, with nearly 1.489 million schools, of which 83 per cent are in rural areas; more than 9.5 million teachers and nearly 265.2 million students from varied socioeconomic backgrounds enrolled in pre-primary to higher secondary levels – 74.7 per cent in elementary stages (MoE, 2023). For higher education, there are 43,796 colleges, 1,072 universities and 8,902 undergraduate, postgraduate and diploma institutes recognized by the All India Council for Technical Education (AICTE) (IBEF, 2023).

Given the vast size of India's education system and the challenges that come with it, technology-based learning has grown exponentially in India in the last few years, and there was a big push towards it during the COVID-19 pandemic. India has become the second largest e-learning country in the world after the United States of America, with an education technology (edtech) market of US\$800 million in 2021 (IBEF, 2023). For example, Digital India (2015) initiated several technology and digital platforms in education to bridge the digital divide, improve access to quality education and enhance the overall learning experience of students and teachers in India.

These initiatives demonstrate India's commitment to strengthening and transforming its education sector. However, the Indian education system is also vulnerable to the impacts of climate change. Human-induced climate change is already causing weather and climate extremes in every region across the globe and the Indian subcontinent is one of the most highly exposed and vulnerable regions (IPCC, 2022a). In India, heatwaves and heat stress are the most significant climate stresses affecting students and their education, followed by erratic monsoons and extreme weather events like flash floods and cyclones. This may lead to a range of impacts on education: from direct loss and disruption in learning due to school closure or inaccessibility, damage to school infrastructure, and displacement and migration, to indirect effects on child education due to climate impacts on their health, well-being and coping abilities. Moreover, climate change affects vulnerable children and adolescents the most and thus exacerbates existing inequalities in education.

The National Education Policy launched in 2020 emphasizes integrating aspects of environment, sustainability and climate change into curricula and learning. In doing so, it aims to instil knowledge, skills, values and dispositions among learners that support responsible commitments to human rights, sustainable development and living, and global well-being (MoE, 2020). In line with the policy's recommendations, curriculum frameworks for various stages of education are being revised to integrate concepts of environment, sustainability and climate change in an age-appropriate manner and with effective pedagogies.



The National Education Policy launched in 2020 emphasizes integrating aspects of environment, sustainability and climate change into curricula and learning.



Right: Through activities like wordplay, students are introduced to concepts of climate change in interactive ways. Milidhane School, Tamil Nadu.

Climate change impacts in India are thus affecting one of the largest education systems and the largest student population in the world.⁸ This sets the stage for policy-makers and education stakeholders to ensure that policy changes translate to effective integration of climate change education in curricula through innovative ways of learning (see Chapter 3, pp. 78-80 for examples). All such interventions should enable and empower learners to take appropriate actions on climate change mitigation, adaptation and resilience. At the same time, they must make education systems climate-resilient so that the impacts of climate change on schools, children and their education are minimized.

Impacts of climate change on schools, children and education

Climate change has many tangible and intangible impacts on the overall education ecosystem that affect learners and their learning environments. A Malala Fund report on climate change and girls' education estimated that, in 2021, climate-related events prevented at least 4 million girls in low- and lower-middle income countries from completing their education (Malala Fund, 2021).

The adverse impacts of climate change and lack of sufficient infrastructure compound the disruption to education caused by the COVID-19 pandemic and hinder an affected region's recovery from it. To contextualize this effect, a 2020 study conducted by the Ministry of Education (erstwhile Ministry of Human Resources) revealed that the COVID-19 pandemic had a severe impact on the education of approximately 240 million schoolchildren in India (Department of School Education & Literacy, n.d.), while a study by the National Council of Educational Research and Training (NCERT) revealed that around 27 per cent of all enrolled students lacked access to the laptops, computers or smartphones necessary to attend virtual classrooms during the COVID-19 pandemic (Arif et al., 2022).

Frequent erratic climatic events are becoming an evident barrier to accessing education, with consequences including increase in child labour and school drop-outs, child marriages, and other situations that have long-term impacts on children's ability to learn and achieve their full potential (Kagawa, 2022). The impacts of climate change on education are further aggravated in low-income households in vulnerable areas as they face additional challenges in supporting their children's education.

⁸ <https://www.ibef.org/industry/education-sector-india>

HEAT STRESS AND HEATWAVES


Heatwaves⁹ are prolonged periods of high air temperature, above the normal maximum. The frequency and intensity of heatwaves has risen over recent years, primarily as a result of climate change. Heat stress and heat-related illnesses can impact the attendance, concentration and overall learning outcomes of children.


According to a UNICEF study, approximately 36 per cent of children under 18 years of age in India were exposed to high heatwave frequency¹⁰ in 2020, and this is expected to increase to 100 per cent by 2050¹¹ (UNICEF, 2022). The study also concludes that 83 per cent of children under 18 years of age in India will be exposed to extreme high temperatures.¹²

Protecting school-going children from heatwaves and their impact will require schools to invest in thermal comfort and cooling mechanisms, which are especially lacking in rural schools.

Areas with water stress situations inhibit schools' access to clean water for drinking, sanitation and hygiene facilities, with implications on students' health and well-being. Heatwaves and high temperatures combined with water scarcity expose young children to various issues like skin problems, heavy sweating, dehydration and heatstroke. It impacts children's ability to concentrate and lowers their school attendance (Kagawa, 2022). Many schools and state education departments are also forced to adjust school timetables to limit children's exposure to excessive heat (and, at times, excessive cold or rain).

FIGURE 10
Protecting children from heatwaves: Information, Education and Communication (IEC) material produced by the Government of India and the World Meteorological Organization (WMO)

 Heatwaves and high temperatures combined with water scarcity expose young children to various issues like skin problems, heavy sweating, dehydration and heatstroke.



The infographic is titled "Children love playing in the Sun heat should not spoil their fun". It features logos for the National Centre for Disease Control, Ministry of Health & Family Welfare, and the World Health Organization. The content is organized into several sections:

- Symptoms of heat related illness:** Includes illustrations for Fainting, Muscle cramps, Seizures, Irritability, Headache, Increased sweating, Weakness/dizziness, Acts or talk confused, Fast breathing and heartbeat, Nausea and vomiting, Difficulty in waking up or can't wake up, and Body temperature rises to 105°F (40.5°C) or higher.
- Be careful when child is:** Shows scenarios like Walking/cycling in Sun, School assembly, and Playing barefoot in Sun.
- First aid measures:**
 - Bring the child indoors or into the shade immediately.
 - Loosen their clothing while maintaining their dignity.
 - Have the child lie down with slightly raised feet.
 - Use fan to increase airflow.
 - Sponge with tap water.
 - If the child is alert and awake, provide frequent sips of cool, clear fluids.
 - If the child vomits, turn them onto their side to prevent choking.
 - If child is unconscious, don't give anything to drink/eat.
- Prevention:**
 - Stay hydrated (with a water bottle icon).
 - Cover your self (with a sun umbrella icon).
 - Play in sun (with a sun icon and a red 'X' over a child playing).
 - Don't lock cars with kids inside (with a car icon and a red 'X' over a child inside).

At the bottom, it states: "If your child has any of severe symptoms immediately visit nearest health care centre or call ambulance 108" and "People at risk" with silhouettes of vulnerable groups.

⁹ In India, an area is said to be experiencing a heatwave if the maximum temperature in a station reaches at least 40 °C or more in the plains, 37 °C or more in coastal areas and at least 30 °C or more in hilly regions. May is the peak month for heatwaves in India (<https://www.who.int/india/heat-waves>).

¹⁰ High heatwave frequency is when the average number of heatwave days in a year is 4.5 or more.

¹¹ As estimated under the SSP1 (Shared Socioeconomic Pathways), which are sustainability / low-emission scenarios suggested by the IPCC's AR 6 in which the estimated temperature rise in 2050 is predicted to be 1.7 °C (IPCC, 2021a).

¹² Extreme high temperatures are when, on average, 83.54 days or more in a year record temperatures exceeding 35 °C.

Right: Students engage with infographics depicting regional rainfall and temperature patterns as part of an exhibition on climate change. Gujarat Science City, Gujarat.



PHYSICAL DAMAGE TO SCHOOL INFRASTRUCTURE

Extreme weather events induced by climate change, such as floods, cyclones and storms have resulted in the destruction of school infrastructure and disrupted the learning environment in many parts of India. Such events have disrupted education by damaging school buildings, classrooms, playgrounds, compound

walls, water and sewer lines, electrical systems and other essential facilities, hampering the teaching and learning process. Furthermore, these occurrences lead to a scarcity of essential resources, causing the already fragile education system in many vulnerable regions to crumble. Table 3 highlights some of the impacts of past natural disasters on education in India.

TABLE 3
Impact of extreme weather events on schools in some Indian states

State	Extreme event	Year	Impact on schools
Assam	Floods	2020	A total of 1,973 elementary school buildings were reported partially or fully damaged (ASDMA, 2020)
Bihar	Flash floods	2017	1,522 school buildings were severely damaged; 7.89 million children in 21 districts were severely affected (Kagawa, 2022)
	Floods	2008	1,429 primary schools and 105 secondary schools were fully or partially damaged (Kagawa, 2022)
Kerala	Floods and landslides	2018	This was the worst flooding since 1924, affecting 1,613 schools. It damaged 1,147 toilet facilities, 842 urinal facilities, 34,251 m of compound walls and 368,731 m ² of playground area in schools. Loss of kitchen infrastructure disrupted schools' midday meal provisions. 71,927 students lost their uniforms and 86,634 students lost educational material. Total loss and damage to the education sector in the state was estimated at INR 1.79 billion or US\$ 21.5 million (Kagawa, 2022)
Odisha	Cyclone Fani	2019	5,735 elementary and secondary schools (19 per cent of the total) were reported damaged. The main damage was reported in Puri district. Damage was reported in roofs (asbestos), water outlets, toilets, kitchen sheds, windows, boundary walls, furniture and sports equipment (Government of Odisha et al., 2019)
Tripura and West Bengal	Heatwave	2023	Schools were shut for a week as temperatures rose above 40°C (Reuters, 2023)
Uttarakhand	Flash floods	2013	873 educational buildings (including primary and secondary schools) were reported partially or fully damaged (Government of Uttarakhand, 2013)

Secondary school drop-out rates in disaster-prone states:

27.3%
in Odisha

20.3%
in Assam

18%
in West Bengal

17.9%
in Gujarat

UDISE+ 2021-22
(Education for all in India, 2023)

Below: Mock drill for disaster preparedness. Ellisbridge Cymkhana, Gujarat.

When remote areas with less infrastructure facilities are hit by low-impact events or natural disasters, it amplifies the existing inequality in access to educational services. For instance, during the Kerala floods in 2018, over 1,700 schools were used as relief camps due to lack of other appropriate facilities. Even when schools reopened, attendance was as low as 20 per cent due to trauma, stress and heightened family needs (UNDRR, 2020). It is crucial to take into account social impacts that extend beyond the immediate aftermath of climate-induced disasters. These impacts should be considered while ensuring the delivery of comprehensive and high-quality education and while planning for climate emergencies.

DISPLACEMENT AND MIGRATION

According to the Global Risks Report 2023, natural disasters and extreme weather events are among the top five risks for India (WEF, 2023), with the potential to trigger permanent or temporary migration and displacement. Events related to climate change, like floods, droughts and rising sea levels, have caused population displacements, particularly in vulnerable rural areas. Approximately 14 million people in India are estimated to have migrated due to slow-onset climate change events such as rising sea levels, water stress, crop yield reduction, ecosystem loss and drought (Singh et al., 2020). This also leads to the migration of children with their families, disrupting their access to education and continuity of learning.

The effect of climate change on school drop-out rates, especially in rural and disaster-prone areas, is evident. It has been observed that while school enrolment rates have been improving (at 98.4 per cent in 2022), drop-out rates are high for the middle school stage (Grades 6 to 8) at 3 per cent, and significantly higher at the secondary school stage (Grades 9 to 10) at 12.6 per cent (Education for all in India, 2023). Drop-out rates at the secondary school stage in disaster-prone states like Odisha (27.3 per cent), Bihar (20.5 per cent), Assam (20.3 per cent), West Bengal (18 per cent) and Gujarat (17.9 per cent) are particularly alarming (MoE, 2023).

In 2023, UNESCO published a study of displacement induced by climate change and its impact on the right to education in five countries in the Asia-Pacific region, including India.¹³ Reported data showed that 4.9 million people were displaced in India due to floods and cyclonic winds in 2021, and that this number has increased 1.7 times between 2010 and 2020 (UNESCO, 2023a). The study revealed displacement scenarios in India taking into account the three most vulnerable migrant groups, which were seasonal migrants, trapped populations and cross-border climate displaced persons (CDP). The study also identified relevant policies and national measures that support school education for children facing the sudden and rapid onset of natural disasters, and highlighted the gaps and barriers therein. Some of the measures covered include the Mahatma Gandhi National Rural Employment Guarantee Act (2005), Disaster Management Act (2005), National Policy on Disaster Management (2009), National Action Plan on Climate Change (2008), Right of Children to Free and Compulsory Education Act (2009) and the draft National Migrant Labour Policy (2021).

The National Education Policy 2020 identifies migrant communities as socially and economically disadvantaged groups in terms of access to education. The NEP also promotes a three-language formula that encourages the study of Indian languages across the country, with a focus on the child's mother tongue or a regional language. However, a climate-displaced population may continue to face the challenge of finding a school that uses the language they are familiar with, and an effective immersion programme for migrant children needs to be considered (UNESCO, 2023s).



¹³ The report states that 21.3 million people were displaced due to climate-induced disasters in Asia and the Pacific in 2021, making it the region most impacted by natural disasters and climate change in the world. The five countries studied in the report are India, Bangladesh, Indonesia, Tuvalu and Vietnam (UNESCO, 2023a).



A system to track and support migrant children's education in Gujarat

Greening communities

The Right of Children to Free and Compulsory Education (RTE) Act, 2009 provides for free and compulsory elementary education of equitable quality to all children in India aged 6 years to 14 years, including children of migrant workers. To support continuity of education for migrant children in Gujarat, from within the state and from other states, the Government of Gujarat introduced a **Migration Card** initiative in 2001. These cards indicate the education level of a migrant student and their grades, based on which the student can continue schooling at their next destination. Under the Migration Card initiative, intra-state migrant children are given space at seasonal hostels in their villages of origin, while inter-state children are given space under Tent Special Training Programmes (Tent STPs). These are temporary schools set up at the parents' work sites and children are taught by a selected teacher (Bal Mitra) who is familiar with the language that the children speak. The programme has provisions for a morning snack and midday meals for the children.

To overcome the limitations of the Migration Card initiative in tracking children accurately, the **Migration Monitoring System (MMS)** was introduced in 2009 by the state government (<https://mms-ss.gujarat.gov.in/>). This online tracking system helped streamline the process of tracking migrant children in Gujarat in real time. Under the MMS, a unique pre-printed number is given to every migrant child and displayed on their migration card. When a student migrates, a coordinator at the sending school cluster fills an online form using the unique number and a receiving coordinator is updated in real time.

The system has proven successful in significantly reducing drop-out rates among migrant children, and is reported to be working well, especially in the tribal districts of Dahod, Panchmahals and Dangs. The general perception has been that with increased awareness, the scheme resulted in a 50 per cent improvement, at least, in children's school attendance (CPR and UNICEF, 2021).

Besides loss of access to education and learning opportunities, temporary or permanent climate-induced displacement and migration has psychological impacts on children too, as they face issues related to social integration and adaptation.

The right to education for climate-displaced individuals requires systematic, holistic and comprehensive protection and fulfilment. Migration policies should consider avoiding negative impacts on education through well-managed displacements. National education laws must prepare for mass upheaval. Understanding the obstacles faced by climate-displaced persons is crucial. Urgent action is needed to provide education in disrupted circumstances and withstand displacement pressures. Collaboration among international organizations, policy-makers, civil society and stakeholders is essential to safeguard the right to education in all displacement settings (UNESCO, 2020b)

HEALTH RISKS

Rising temperatures, extreme precipitation and drought conditions are conducive to the growth and spread of pathogens and exacerbate certain vector-borne diseases, like malaria and dengue fever, that are climate sensitive. As per India's Second National Communication to the UNFCCC, increasing temperatures and changing precipitation patterns alter the distribution

patterns of vector species, sending them into new regions at higher altitudes, and extend their seasonal transmission windows (MoEF, 2012). According to the World Health Organization's World Malaria Report 2022, India reported 441,610 confirmed cases of malaria in 2021, most among children (WHO, 2022). Malaria causes severe illness and long-term complications, and also impacts regular school attendance among children. Floods, contaminated water sources and inadequate sanitation facilities in schools can also expose children to water-borne illnesses like diarrhoea, cholera and typhoid fever, affecting their health and educational outcomes.

Malnutrition is already a serious concern, especially among Indian children,¹⁴ and is likely to be aggravated by climate-induced food insecurity (Kagawa 2022). Air pollution also increases the risk of chronic and acute lower respiratory infections, pneumonia and associated mortality among young children (UNICEF, 2017). Disasters and changing climatic conditions are causing psychological distress to students. As reported by *The Times of India* (Mohapatra, 2019), more than 10,000 children under 17 years old in Puri district of Odisha required psychosocial counselling as they showed symptoms of post-traumatic stress disorder, such as anxiety and insomnia, even a month after the occurrence of Cyclone Fani.

¹⁴ Thirty-five per cent of children under 5 years of age in India suffer from stunting. Thirty-three per cent of children under 5 years of age are underweight (Kagawa, 2022).



Climate impacts on children in India are severe, with far-reaching consequences on their learning opportunities.

Above: A young girl identifies the Indian bael (wood apple) tree in a garden near her school. Sanjeevani Medicine Garden, Gujarat.

Climate impacts on the education of girls, and poor and vulnerable children

According to a 2023 UNICEF report, India ranks 26 out of 163 countries in the Children's Climate Risk Index of 2021 (UNICEF, 2023b), which indicates that climate impacts on children in India are severe, with far-reaching consequences on their learning opportunities, physical and mental capacities and future opportunities for healthy and better lives.

Natural disasters and other shocks caused by climate change have serious implications on the livelihoods of families, especially households without secure sources of income, such as urban slum dwellers, labourers or marginalized communities. Consequently, children drop out of school in order to help support their families. Child protection issues like child labour, child marriage and child trafficking can all arise as a result of climate change-induced economic shocks.

In Odisha, the three districts most devastated by Cyclone Fani in 2019 – Mayurbhanj, Balasore and Ganjam – are also districts where child marriage rates are particularly high. Adolescent girls from the most marginalized communities in these districts were at higher risks of forced marriage in the aftermath of the Cyclone (Government of Odisha et al., 2019), when child marriages increased to 35 per cent.

Similarly, after Cyclone Amphan, the Sundarbans delta in West Bengal reported a significant spike in child marriages.¹⁵ In Bihar, analysis of data concerning natural disasters,

child protection and school drop-out rates reveals that districts prone to disasters have higher percentages of child marriages and are also hotspots for child trafficking and child labour.

In these disaster-prone districts, school drop-out rates are the highest and transition rates from elementary to secondary schools are lower than in other districts (UNICEF, 2017).

Prolonged school closures (like those due to the COVID-19 pandemic) made girls, especially those 13 years to 16 years old, vulnerable to child marriage (Acharya, 2021; Kagawa, 2022). Vulnerability to climate change is differentiable by gender. Limited control over resources and decision-making, constraints on access to education and information and less social mobility due to cultural norms manifest themselves in higher levels of vulnerability among women and girls as compared to men and boys (MoEFCC, 2012; NDMA, 2019). In particular, girls experience multiple vulnerabilities, including poor nutritional status, early marriage and early childbearing. Forty-three per cent of girls drop out without completing secondary education (UNICEF, n.d.; Kagawa, 2022).

It is also observed that children living in arid regions in India bear family obligations of fetching water, and face challenges in attending school regularly during periods of water scarcity or drought. They also face health issues on account of exposure to extreme heat and poor-quality water.

¹⁵ <https://www.financialexpress.com/life/science-covid-climate-crisis-leads-to-sharp-rise-in-child-marriages-in-sundarbans-2338002/>

Communities and societies with higher average levels of education experience much lower losses in human lives from climate-related disasters.

Air pollution is closely linked to climate change and has significant impacts on the health of children. Exposure to air pollution can lead to respiratory and heart disease as well as strokes. Furthermore, air pollution can affect children's cognitive development and academic performance. This is particularly concerning given that India has some of the highest levels of air pollution in the world, with many cities experiencing dangerous levels of particulate matter.

knowledge, skills, values and attitudes required for the informed actions and contributions that may lead our society to the 1.5°C pathway set out in the Paris Agreement.¹⁶ Several studies have shown that communities and societies with higher average levels of education experience much lower losses in human lives from climate-related disasters (UNESCO, 2023a). Better educated societies are more resilient and have greater adaptive capacity vis-à-vis climate change. They are also more capable of creating opportunities to innovate and implement climate mitigation solutions.

Education to address climate change in India

Climate change is a global emergency that requires individuals to be made aware of and to understand its causes, impacts and consequences, in order to make informed decisions and adopt, innovate and scale-up effective and locally appropriate solutions towards climate change mitigation and adaptation. Education is the most promising tool in this regard: it offers an all-encompassing, systematic approach to equip learners with the necessary

There exists a reciprocal influence between education and climate change in that there is a two-way relationship between these two domains. Education plays a crucial role in shaping individuals' understanding, awareness and actions regarding climate change. At the same time, climate change impacts education systems, requiring adaptation and response from curricula, teaching methods, learning spaces and infrastructure. Education empowers individuals to understand and respond to climate change, while climate change necessitates adaptation and integration of climate-related knowledge and skills into educational systems, as demonstrated in Table 4.



TABLE 4
Reciprocal influences between climate change and education

Education influencing climate change	Climate change influencing education
Imparting knowledge, skills and attitudes for climate actions: education provides knowledge about climate change, its causes, impacts, and the range of solutions and actions on mitigation, adaptation and resilience. It empowers learners to take appropriate actions to prevent and mitigate climate change impacts and address its challenges within their respective areas and fields	Policy inclusion: addressing climate change also calls for the development of inclusive policies that promote integration of climate change education, environmental literacy, youth empowerment, vocational training, green skilling, community engagement and sustainability principles in various national frameworks (like policies on climate change, disaster management, youth development, etc.)
Building capacity: education equips individuals with the skills, competencies and tools necessary to engage in climate-related discussions, professions, research, technology development, policy-making and community initiatives	Curriculum integration: climate change requires integrating climate-related topics into educational curricula across disciplines, ensuring students are equipped with the knowledge and skills to understand and respond to climate change
Shaping attitudes and behaviours: education can instil values of environmental stewardship, sustainability and responsible consumption, influencing individuals' actions towards mitigating and adapting to climate change	Community engagement: climate change can mobilize educational institutions and stakeholders to promote a whole-institution approach ¹⁷ and engage with local communities, fostering partnerships and initiatives for climate adaptation, mitigation and resilience
Driving innovation: education fosters critical thinking, problem-solving and creativity, enabling the development of innovative solutions and technologies to address climate challenges	Education infrastructure resilience: the potential risks and impacts of extreme weather events require school infrastructure design and planning to become resilient, safe and child-friendly

Source: CEE research team

¹⁶ The overarching goal of the Paris Agreement, a legally binding international treaty on climate change that came into force in November 2016, is to hold 'the increase in the global average temperature to well below 2 °C above pre-industrial levels' and pursue efforts 'to limit the temperature increase to 1.5 °C above pre-industrial levels.' The 1.5 °C pathway is the range of scenarios (or shared socioeconomic pathways) of the potential future of greenhouse gas emissions and other climate forcers that

provide approximately 50 per cent to 66 per cent chances of global warming either remaining below 1.5 °C or returning to 1.5 °C by around 2100, following an overshoot (IPCC, 2018).

¹⁷ A whole-school approach transforms institutions to empower learners to be change agents for sustainable development. It aligns every aspect of the institution with sustainability principles, creating an environment where students both learn and live by sustainable values.



Environmental education has been mandated in India by a directive of the Supreme Court of India in 1991, which read, ‘We accept in principle that through the medium of education, awareness of the environment and its problems related to pollution should be taught as a compulsory subject.’ However, the inclusion of environmental education in formal education curricula only happened with the National Curriculum Framework (NCF) of 2005 (in school education) and the University Grants Commission (UGC) Guidelines of 2003 (in higher education). The NCF 2005 stated, ‘Concerns and issues pertaining to the environment should be emphasised in every subject and through a wide range of activities involving outdoor project work’ (NCERT, 2005). Accordingly, the syllabus and textbooks were upgraded.

At the higher education level, the UGC, which promotes and coordinates higher education in India, introduced a 6-month compulsory core module on environmental studies at the undergraduate level, and noted, ‘The importance of environmental science and environmental studies cannot be disputed with continuing problems of pollution, loss of forest, solid waste disposal, degradation of environment, issues like economic productivity and national security, Global warming, the depletion of ozone layer and loss of biodiversity’ (UGC, 2023). Thus, climate change has been part of higher education in India since 2003, and been taught in schools, through its environmental manifestations, since 2005.

Currently, India is in the process of implementing transformative changes at different levels of education, including early childhood care and education (ECCE), school education and higher education, with due attention to environment, sustainability and climate change. The National Education Policy of 2020 lays down a vision for education in India and has made major recommendations for a more holistic and multidisciplinary education system, mandating curricular integration of essential subjects, skills and capacities,¹⁸ including environmental education, and climate change is one of the first subjects mentioned in this regard. The NEP 2020 has also emphasized vocational education as much as academic learning from the pre-school stage to eliminate hard separations in theoretical and practical learning.

A key principle of the NEP 2020 is promoting respect for diversity, local contexts and rootedness

“ We accept in principle that through the medium of education, awareness of the environment and its problems related to pollution should be taught as a compulsory subject.

” Environmental education as mandated in India by a directive of the Supreme Court of India in 1991

Thus, as highlighted in Table 4, education and climate change are interconnected and mutually influential.

Knowledge of climate change facilitates and promotes actions for sustainable development across sectors. Educating children and the youth on climate change is key to inspiring behavioural change and driving local actions for climate mitigation, adaptation and resilience.

¹⁸ The NEP 2020 has recommended concerted curricular and pedagogical initiatives, including the introduction of contemporary subjects such as Artificial Intelligence, Design Thinking, Holistic Health, Organic Living, Environmental Education, Global Citizenship Education (GCED), etc. at relevant stages to develop these various important skills in students at all levels.



Above: Creating art on the theme of sustainable living by repurposing waste materials. Rachna School, Gujarat.

Facing page: Empowering the future: young children participating in composting. The Planet Discovery Centre, CEE, Gujarat.

in India and its rich ancient and modern knowledge systems and traditions. It recommends value-based education, where students will be taught the importance of 'doing what's right' and making ethical decisions at a young age. The NEP focuses on education to foster creativity, critical thinking and problem-solving among learners in a rapidly changing world, while developing knowledge, skills, values and dispositions that support responsible commitments to human rights, sustainable development and living (MoE, 2020). In this way, the NEP has laid down a vision and foundation for appropriately integrating various aspects of climate change into the Indian education system, including not only its scientific aspects but also its practical aspects, local contexts, social and economic concerns, creative and innovative solutions, traditional knowledge, equity and justice.

Four National Curriculum Frameworks have been or are being devised as per the recommendations of the NEP 2020, which will redefine curricular areas, learning standards, content, pedagogies and assessments across educational stages. These are: the National Curriculum Framework for Foundational Stage 2022 (in implementation); the National Curriculum Framework for School Education 2023 (in implementation); and two upcoming NCFs for teacher education and adult education.

The NCF for Foundational Stage 2022 includes continued attention to health, safety, care and nutrition for children aged 3 years to 8 years with emphasis on play-based, activity-based and enquiry-based learning. Playing and spending time with nature, valuing its elements and exploring and discovering one's immediate

environment through nature walks forms the basis of early childhood learning and care, which has a lifetime of positive consequences for all individuals as they grow up (NCERT, 2022b).

The draft NCF for School Education 2023 has introduced 'Environment' as a cross-cutting theme throughout school education. In secondary school (Grades 9 to 12), it has introduced an interdisciplinary curricular area that mandates studying environmental education in Grade 10 and provides a choice-based course on sustainability and climate change in Grades 11 and 12 (NCERT, 2023). Likewise, the University Grants Commission has recently drafted guidelines for a mandatory 4-credit course on environment education at the undergraduate level across all colleges and universities in the country (UGC, 2023).

While policy has been laid out and frameworks and guidelines are being put in place, the education system as a whole now needs to rise to the occasion and actively engage and collaborate to ensure effective implementation of and alignment with these policy goals.

There are several challenges to implementing policy effectively in a country like India, which has one of the largest education systems of the world and the highest number of children in schools, spread across many vulnerable regions. At the same time, there are opportunities, such as leveraging traditional knowledge, building synergies between climate change and the education sector, adopting innovative teaching methods, youth engagement, community participation and building partnerships for greening education, etc.



Above: Learning about the connection and balance between living organisms through the food pyramid. Vikram A. Sarabhai Community Science Centre, Gujarat.

Mainstreaming climate change education in India

Respect and care for nature and the environment is imbibed via the cultural upbringing and observational learning of most Indian children.¹⁹ Several traditional practices and professions in India contribute to combating climate change and promoting sustainable development. These professions often have inherent sustainability principles and are rooted in local knowledge and practices. For instance, traditional farming (organic farming), agro-forestry and silviculture, forest-based livelihoods, Ayurvedic and herbal health care (based on indigenous medicine systems), traditional handicrafts and artefacts production, khadi textiles and natural dyes, vernacular architecture and traditional construction, traditional water harvesting engineering, etc. Such traditional wisdom, practices and professions have helped India progress on a sustainable pathway, with mindful resource utilization and respect for nature keeping its carbon footprint low.

In India, environment education (EE) has been the foundation for Education for Sustainable Development (ESD) and climate change education (CCE). The education system in India incorporated certain aspects of environment education in school curricula as early as 1930 (NCERT, 2006). The Kothari Commission (1964-66) also suggested that primary school education should offer a subject on environmental studies to nurture right attitudes towards the environment from early childhood. In 1984, the precursor to the Ministry of Environment, Forest and Climate Change, the Ministry of Environment and Forests, realized the need for education as an integral part of India's environmental strategy and, simultaneous to its own establishment, created the Centre for

Environment Education (CEE) to set the pace for environment and sustainability education in the country.

Furthermore, as a result of a public interest litigation by M. C. Mehta, the Supreme Court of India passed a judgement in 1991 making it compulsory for every formal education programme, right from school to university, to include a component on environmental education. The NCERT prepared a National Curriculum Framework in 2005, a comprehensive document to guide the process of integration of environmental issues in formal education curricula. Accordingly, the states and central boards developed their own textbooks, in which environment and sustainability were integrated, mainly across the subjects of science, environment science and geography. The concept of climate change within environment education in schools was not clearly spelled out or taught. However, the recent NCF for School Education 2023 (NCERT, 2023) has included climate change as an interdisciplinary area, and laid emphasis on integrating its concepts in all stages of school education, as indicated in the previous section.

In 2003, the University Grants Commission introduced a dedicated course on environmental studies at the undergraduate level, which included some aspects of climate change. Global warming was a topic in one of its eight units. At a larger, community level, stakeholders' trainings and public awareness campaigns on climate change picked up momentum only after the launch of the National Action Plan on Climate Change for India in June 2008.

Earlier, in 2001-02, the then Ministry of Environment and Forests had launched the National Green

¹⁹ Observational learning describes the process of learning by watching others, retaining that information and later replicating the behaviours that were observed.

Corps (NGC) to enhance the national outreach of nature and environmental education beyond the formal curriculum. Through this programme, schools were encouraged to set up eco clubs that would get involved in co-curricular action on environmental awareness and conservation in the school and community. Over 100,000 schools across India are a part of the NGC network, through which such activities take place round the year.

Since the launch of the SDGs in 2015, Education for Sustainable Development has gained momentum and includes several crucial challenges to sustainability that the world is facing. There is a need to educate and engage everyone to achieve the 2030 Agenda for Sustainable Development, including climate actions through a foundation of quality and inclusive education.

The fourth International Conference on Environment Education

The fourth International Conference on Environment Education, hosted in Ahmedabad by the CEE in 2007, marked 30 years of the global journey of environment education, which began in Tbilisi, Georgia, in 1977. The conference deliberated on and paved a way towards the strategic role of environmental education in achieving sustainable development, as the UN Decade on Education for Sustainable Development was observed from 2005 to 2014.

Education to address climate change in the Indian scenario

Environment education, Education for Sustainable Development and climate change education are overlapping and interconnected, especially in India's context. To understand their nuances,

Table 5 defines these three kinds of education and their status in India in terms of curriculum inclusion, pedagogy, initiatives and non-formal learning.

TABLE 5

Environment education, Education for Sustainable Development and climate change education in India

	Definition	Indian scenario
Environmental education (EE)	Environmental education is the process of recognizing values and clarifying concepts in order to develop the skills and attitudes necessary to understand and appreciate the inter-relatedness of people, their cultures and their biophysical surroundings. Environmental education also entails practise in decision-making and the self-formulation of codes of behaviour about issues concerning environmental quality (Sarabhai et al., 2007)	<p>Curriculum inclusion:</p> <ul style="list-style-type: none"> • EE became part of the school curriculum in India as early as the 1930s (NCERT, 2006) • A report on education for national development by the Kothari Commission (1964-66) recommended EE while teaching science at the primary stage, which was implemented in 1977 • The National Curriculum Frameworks brought out by the NCERT in 1975, 1988 and 2000 reiterated the importance of EE in school education and it has thus been one of the priority areas of concern in all curriculum development programmes • EE was emphasized at all stages of education via a Supreme Court directive in 1991, which was further mandated through another directive in 2003 making EE compulsory at all levels of education. The NCF 2005 included separate curriculum guidelines for this • The UGC prescribed a mandatory 2-credit course on EE at the undergraduate level in 2003 • The NCF 2023 recommends including EE in subjects at appropriate school stages for the development of moral and ethical capacities in an interdisciplinary manner • EE is given greater impetus in the UGC's draft guidelines of 2023, which introduce a mandatory 4-credit course on EE at the undergraduate level <p>Pedagogy: curriculum-based, activity-based, whole-school and project-based learning, classroom transactions, eco clubs, outdoor education, community engagement</p> <p>Initiatives: NEAC, EOSE, EESS, NGC, NEC, GSDP, Green School programme, Eco-schools India, Paryavaran Mitra, Earthian, Greening Education Partnership</p> <p>Non-formal learning: various organizations and institutions promote and organize environmental awareness through camps, campaigns, workshops and seminars. The government emphasizes various environment conservation efforts and engages children, young people and communities in various initiatives</p>



ACTION PLAN FOR UNSDGs



	Definition	Indian scenario
Education for sustainable development (ESD)	ESD empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society for present and future generations, while respecting cultural diversity. It is about lifelong learning and is an integral part of quality education (UNESCO Institute for Statistics, 2021)	<p>Curriculum inclusion:</p> <ul style="list-style-type: none"> ESD is being treated as part of EE in India. Knowledge, values and attitudes are imparted through the concepts of pollution and resource intensive development and issues of environment and climate change. It is introduced as a concept in middle school and deeper understanding is developed at higher levels With NCF 2023, a dedicated course on Sustainability and Climate Change will be introduced as part of an interdisciplinary curricular area in secondary school (Grades 11 and 12) The EE course at undergraduate levels includes various concepts of sustainable development in all its previous 8 units and current 9 units following the UGC 2023 guidelines <p>Pedagogy: classroom transactions, case studies, community engagement, action-based learning</p> <p>Initiatives: National Green Corps, Green School programme, Eco-schools India, Paryavaran Mitra, Greening Education Partnership</p> <p>Non-formal learning: Capacity-building programmes (education, training, awareness and public participation) are held by various organizations and have gained momentum after the 17 global SDGs were announced in 2015. Various government agencies, educational institutions and NGOs conduct programmes and workshops on the SDGs to promote lifelong learning of sustainable development among communities and specific target groups</p>
Climate change education (CCE)	Climate change education are efforts made to enable learners to respond to climate change after comprehending its causes and impacts, by developing appropriate responses such as sustainable lifestyle choices and building resilience to its adverse impacts (UNESCO, 2015, p. 9)	<p>Curriculum inclusion:</p> <ul style="list-style-type: none"> CCE is an integrated part of EE in India. Knowledge, values and attitudes are imparted through the concepts of environment and sustainability, often with no direct mention of climate change, specifically in lower grades With NCF 2023, a dedicated course on sustainability and climate change will be introduced as part of the interdisciplinary curricular area in secondary schools. A dedicated unit on climate change impacts, mitigation and adaptation will be added to the mandatory 4-credit course on environmental education at the undergraduate level as per the UGC's 2023 guidelines <p>Pedagogy: Cross-curricular integration, project-based learning, classroom transactions, case-studies, action-oriented learning</p> <p>Initiatives: SCGJ, GSDP, Paryavaran Mitra, climate-friendly schools, climate-resilient schools, Mission LiFE, Greening Education Partnership</p> <p>Non-formal learning: capacity-building programmes (education, training, awareness and public participation) under the National Action Plan on Climate Change (NAPCC) and its eight missions. Various educational institutions and NGOs conduct programmes and workshops on climate change mitigation and adaptation</p>

UNESCO initiatives on climate change education

UNESCO plays a crucial role in promoting climate change education and raising awareness about the impacts of climate change. It recognizes the importance of education in fostering a deeper understanding of climate change, its causes and its consequences. The key aspects of UNESCO's role in climate change education include advocacy and policy development, curriculum development, teacher training and capacity building, raising awareness, people participation, research, knowledge sharing and international cooperation.

UNESCO holds the primary position within the United Nations as the agency responsible for advancing Education for Sustainable Development (ESD). Building on the initiatives of the United Nations Decade of Education for Sustainable Development (2005-2014) and the Global Action Programme (GAP) on ESD (2015-2019), a new framework on **Education for Sustainable Development: Towards achieving the SDGs (ESD for 2030)** was adopted by UNESCO at its 40th General Conference and acknowledged by the UN General Assembly.

ESD for 2030 emphasizes education's contribution to the achievement of the SDGs. It aims to review the purpose and values that underpin education and reorient all levels of education and learning towards contributing to sustainable development. Given the fact that there is very little time left

to achieve the SDGs, it is crucial to accelerate ESD in the Decade of Action to deliver the goals (UNESCO, 2020a). Through its ESD for 2030 roadmap, UNESCO helps countries incorporate ESD in their education policies and systems. The roadmap serves as a practical tool to guide countries in their efforts to foster sustainability, equipping them with actionable steps and measurable indicators to gauge progress in implementing ESD.

PRIORITY AREAS FOR ESD BEFORE 2030

- **Advancing policy** – to mainstream ESD in the education sector and all concerned sectors of sustainable development.
- **Transforming learning environments** – providing opportunities for learners to acquire the knowledge, skills, values and attitudes needed to achieve the 17 SDGs and act through a whole-institution approach towards ESD.
- **Building capacities of educators** – to foster societal transformation for a sustainable future and systematically integrate ESD in training institutions for educators.
- **Empowering and mobilizing the youth** – to strengthen young people to be agents of change and systematically provide training for the youth and youth trainers on ESD.
- **Accelerating local level actions** – to achieve sustainability at local levels.

Facing page: A bulletin board displays artwork by children on the action plan for the UN SDGs. ASN School, New Delhi.

Right: A student shares a version of snakes and ladders that he adapted to explain the repercussions of unsustainable behaviour. ASN School, New Delhi.





MAJOR ACTIVITIES OF UNESCO RELATED TO ESD AND CLIMATE CHANGE

- Coordinating and implementing ESD for 2030.
- Fostering efforts to make education a more central part of the international response to climate change.
- Facilitating dialogue and exchange of experiences on climate change education through international expert meetings.
- Supporting countries integrate climate change education into their school systems through capacity-building and a whole-school approach.
- Offering free access to educational resources online and developing technical guidance materials and teaching and learning resources, like its 6-day online course for secondary teachers called Climate Change in the Classroom.
- Raising awareness and promoting good practices through its GAP Clearinghouse.
- Working with 13 UN agencies to promote climate change education at high-level events such as the annual UN Climate Change Conferences (COPs) via the UN Alliance on Action for Climate Empowerment.
- Serving as secretariat for the Greening Education Partnership (GEP).
- Mobilizing schools for climate action through its Associated Schools Network (ASPnet).

Finally, UNESCO publications in the realm of environmental education provide essential knowledge, promote best practices and facilitate global cooperation to address environmental challenges and promote a more sustainable future.



CASE STUDY 2

Greening schools

UNESCO Associated School Network (ASPnet)

The Associated Schools Project Network (ASPnet) was formed in 1953. It aimed mainly at enabling schools to lead innovation for global citizenship, inter-cultural understanding and sustainability, enhancing international cooperation and collaboration, knowledge sharing and partnerships between countries and schools, and developing capacities for innovative teaching and participatory learning, particularly through whole-school approaches. ASPnet takes a whole-school approach (WSA) to transform learning and training environments, guided by the Global Action Programme on Education for Sustainable Development. UNESCO defines WSA as an educational process that ‘involves addressing the needs of learners, staff, and the wider community, not only within the curriculum, but across the whole-school and learning environment.

It implies collective and collaborative action in and by a school community to improve student learning, behaviour and well-being, and the conditions that support these!ⁱ

ASPnet has invited all its member institutions, 11,500 schools in 180 countries, to adopt the whole-institution approach and develop and implement similar school action plans to counter climate change at the local level. The UNESCO National Commission is the nodal agency for this programme. As per a 2019 UNESCO report, sixty-five schools in India are a part of the ASP network and this can be a good platform for these schools to integrate ESD across their learning communities (UNESCO, 2022).

ⁱ <https://www.ibe.unesco.org/en/glossary-curriculum-terminology/w/whole-school-approach>



The GEP seeks to assist countries in integrating climate change education across their education systems, curricula and capacities.

Greening Education Partnership

A 2021 study by UNESCO shares the importance of integrating climate change education globally. It highlights that around half of the 100 countries reviewed had no climate change mentioned in their national curriculum frameworks; 95 per cent of surveyed teachers felt that teaching climate change was important but less than 30 per cent felt ready to teach about climate change in relation to their local contexts; and 75 per cent of the youth were frightened about their future (UNESCO, 2021b).

To address these gaps, the UN Secretary-General launched the Greening Education Partnership (GEP) at the Transforming Education Summit in September 2022 'to tackle the climate crisis through a comprehensive climate change education framework'. The GEP is to be led by Member States in partnership with like-minded stakeholders. UNESCO serves as the secretariat to this global initiative, which encompasses all aspects of education to respond to the urgent call for climate action in partnership with all stakeholders that work on addressing climate change through education. The GEP seeks to

assist countries in integrating climate change education across their education systems, curricula and capacities. It aligns with the four essential elements of transforming education systems to deal with climate change impacts.

The GEP's four pillars for transforming education



Greening schools



Greening curriculum



Greening teacher training and education systems' capacities



Greening communities

Throughout this report, India's state of education in relation to climate change is analysed as per these four pillars, using infographics, case studies and policy recommendations.



Facing page: Young children collect plastic waste from their school campus. The Planet Discovery Centre, CEE, Gujarat.

Right: Using activity-based learning to explain soil erosion as a consequence of deforestation. Rachna School, Gujarat.

Greening Education Partnership



The Greening Education Partnership is led by Member States and Partners and is supported by a UNESCO secretariat

Greening schools



VISION

From early childhood through adult education, work to ensure that all schools achieve green school accreditation, including teacher-training and higher education institutions.

GOAL

All countries will have adopted a green school accreditation scheme with at least 50 per cent schools, colleges and universities with green accreditation and operating sustainably.

LEAD ORGANIZATIONS

- Foundation for Environmental Education (FEE)
- Aga Khan Foundation
- World Food Programme (WFP)

Greening curriculum



VISION

Embrace a lifelong learning approach that integrates climate education into school curricula, technical and vocational education and training, workplace skills development, teaching materials, pedagogy and assessment.

GOAL

The number of countries that include climate education in school curricula at the pre-primary, primary and secondary levels will have at least doubled from the current approximately 45 per cent.

LEAD ORGANIZATIONS

- Dubai Cares
- Office for Climate Education
- International Renewable Energy Agency (IRENA)

Greening teacher training and education systems' capacities



VISION

Support teachers and policy-makers through the integration of climate education in pre-service and in-service teacher training, building the capacity of school leaders and key education stakeholders.

GOAL

All school leaders and at least one teacher per school will have been trained on how to integrate climate education into teaching and learning throughout the school.

LEAD ORGANIZATIONS

- UNICEF
- Education International
- Global Partnership for Education

Greening communities



VISION

Engage the entire community by integrating climate education in lifelong learning, in particular through community learning centres and learning cities.

GOAL

All countries will be able to report at least three different ways learning opportunities are made available for adults outside the formal education system to develop the skills, attitudes and actions that will foster community resilience to tackle climate change.

LEAD ORGANIZATIONS

- Food and Agriculture Organization (FAO)
- World Organization of Scout Movement
- UNESCO Institute for Lifelong Learning



The adventure of learning: children embark on an interactive nature walk. The Planet Discovery Centre, CEE, Gujarat.

Summary

India is highly vulnerable to climate change, which is affecting every sector of its economy and a significant share of its population. Climate change is impacting India's education sector via loss and damage to education infrastructure, resources, school closures, displacement, loss and disruption in learning, adverse impact on health and well-being of learners, etc. thus exacerbating the existing challenges of quality education.

India is successfully decoupling its economic growth from greenhouse gas emissions and taking proactive measures to mitigate climate change in pursuit of its Nationally Determined Contributions and long-term goal of achieving net zero by 2070. It is also playing an active role in global climate actions through leading international coalitions and advocating for lifestyle changes for the environment (through Mission LiFE).

The crucial role of education in addressing climate change is being recognized the world over. Two elements of sustainable development – SDG 4 (Quality Education) and SDG 13 (Climate Action) – can come together and work in synergy through policies, initiatives and actions to address climate change through education.

In India, environmental education has been the foundation for Education for Sustainable Development and climate change education, which are incorporated in its curriculum, pedagogy, programmes and non-formal learning.

To tackle the climate crisis through a comprehensive climate change education framework and address the gaps in teaching and learning climate change, the Greening Education Partnership was launched by the UN Secretary-General at the Transforming Education Summit in September 2022. UNESCO acts as the secretariat of the GEP and assists countries in integrating climate change education across education systems.



4.8.23

TIME IS GOLD

WORD PLAY - NATURE

B C E G I K
L A D J O
M X P S
Z W V Q
F H T

A

B

... HIGH SCHOOL



CHAPTER 3

Climate change education in India

This chapter provides a comprehensive view of climate change education in India. It highlights the current scenario and impactful initiatives in the country from the perspective of the four pillars of the Greening Education Partnership: greening schools; greening curriculum; greening teacher training and education systems' capacities; and greening communities.

Left: A climate change educator uses activity-based teaching methods in the classroom. Milidhane School, Tamil Nadu.



Climate change education in India

This chapter looks closely at climate change education delivery and implementation across educational stages in India and the respective roles and responsibilities of actors, beneficiaries and stakeholders in the process. It highlights key policies that define climate change education, including those at the local, state and national levels. This chapter also

presents important initiatives in formal and non-formal education, as well as examples of climate action through youth leadership and community engagement. It includes case studies and best practices, seen from the perspective of the four pillars of the Greening Education Partnership (GEP) – greening schools, greening curriculum, greening teacher training and education systems’ capacities, and greening communities.

The status of climate change education in India

Climate change in school curricula

In India, climate change education has been incorporated indirectly and to a limited extent through environmental education initiatives. In 1991, the Supreme Court of India directed the inclusion of environmental education in formal education systems to enable citizens to fulfil their fundamental duty to ‘protect and

improve the natural environment’, as set out in India’s Constitution (IIEE, 2023). Further, based on subsequent court judgements, the National Council of Educational Research and Training (NCERT) prepared a model syllabus in 2003 for environmental education for Grades 1 to 12, and integrated environmental studies in the National Curriculum Framework (NCF) of 2005 to guide the integration of environmental education into school textbooks (NCERT, 2005; Sarabhai and Joshi, 2018; IIEE, 2023).

Below: Eco-anxiety: a picture of a polluted future as a result of factories and deforestation. Milidhane School, Tamil Nadu.





Above: Teachers explain the functioning of solar panels. CSI School, Tamil Nadu.

As a result, subjects like environmental studies (EVS), science and the social sciences began to include aspects and topics related to climate change, such as pollution, conservation of natural resources, and renewable energy. However, there was often no clear or direct connection made between such topics and climate change, and the curriculum was thus not able to demonstrate the interdisciplinary nature of climate change.

While the 2005 curriculum marked a renewed emphasis on addressing climate change through education in the Indian system, it fell short in providing age-appropriate, comprehensive, timely and well-designed syllabi. Ideally, these syllabi should have followed an incremental approach, introducing climate-related concepts at the appropriate educational stages. This would have allowed students to develop a better understanding of the interconnected and interdisciplinary nature of climate change.

Many of these required changes are noted in the revised NCF of 2023. The inclusion of the multifaceted character of climate change was one of the most notable changes from the NCF of 2005. A case in point is that while the NCF 2005 made no mention of climate change, the NCF 2023 mentions it fifty-two times. In a way, this reflects India's commitment to integrating climate change education into the formal education system and simultaneously addressing sustainability issues.

The Central Board of Secondary Education (CBSE) and some state educational boards

discuss climate change briefly in their curricula, and within subjects like the sciences and social sciences (particularly geography) and environmental studies. For instance, school textbooks and syllabi in Bihar, Kerala and Odisha contain illustrations of climate change, disaster risk reduction (DRR) and other environment-related topics (Kagawa, 2022). The Safe Saturday Programme, which is part of the state-wide Chief Minister School Safety Programme (CMSSP) in Bihar, provides practical and action-oriented learning to address the complex challenges posed by climate change. Its peer-to-peer method is crucial in empowering students to become agents of change. The programme also includes a systematic teacher-training programme, which provides teachers with the tools and knowledge they need to effectively teach about climate change.

However, while these examples may be helpful, there is still a significant need for more comprehensive, relatable and hands-on education on these issues and for such programmes to be rolled out to other regions in India.

In an attempt to review the translation of policy to practice, this chapter provides an analysis of various interventions on climate change education in India, as well as an overview of climate literacy among different stakeholders.

The following section presents an analysis of the NCERT curriculum, detailing topics related to climate change that are currently covered through subjects taught in schools.



Integration of climate change concepts in existing NCERT textbooks

The NCERT designs curricula for school education in India and develops syllabi and textbooks based on it. NCERT textbooks are the most widely used textbooks in India. They are prescribed by the Central Board of Secondary Education, the national board of education in India, across its approximately 29,000 affiliated schools in the country (CBSE, 2023). Additionally, it has been reported that teaching in twenty-three Indian states is done from NCERT books (Mani, 2022), showcasing the wide outreach and, at the same time, the imperative need to integrate issues of climate change into these textbooks. This section presents a review of climate change concepts included in current NCERT textbooks, to understand the integration of climate change in formal school education in India. It covers the science, environmental studies and social science textbooks used at various stages of education.

Above: Paintings and murals in schools spread more awareness on the importance of education. Sarvodaya Co-Ed Vidyalaya, Bhogal, New Delhi.



PREPARATORY STAGE

At the earliest school grades, the focus of teaching and learning is on building a foundational understanding of the environment and its various components. In these grades, textbooks use a storytelling structure that connects many elements of the environment to the student’s own life and surroundings. Students are introduced to weather patterns and seasons, and weather variance, as well as discussions on the potential impact of human activities on the environment.

As students move up grades in primary school, their textbooks emphasize the importance of conservation and sustainable practices through practical examples. Topics related to climate change are introduced and taught gradually from Grades 3 to 5 as environmental studies. Students become familiar with the three ‘R’s of waste management: Reduce, Reuse and Recycle. Additionally, textbooks discuss the importance of saving water and energy, and students are encouraged to adopt practical ways to conserve these resources both at home and at school.

These textbooks also introduce the concept of natural resources, such as forests and water bodies, emphasizing the need to protect and manage them sustainably for future generations. Case studies and activities are often used to illustrate these concepts. At this stage, several basic concepts about the environment, such as water cycles, evaporation and vector-borne diseases, are covered in the textbooks, to provide a broad overview of environmental dynamics.

While direct correlations between such topics and climate change need not be made explicitly, it would improve the learning process if connections were clearly demonstrated. For instance, it is useful to interrelate the concept of climate while discussing seasons and the weather. As students progress to higher grades, their textbook discussions of climate change and its impact on the environment and society should also become more comprehensive to adapt to and stimulate learners’ increasing levels of understanding.



MIDDLE STAGE

In middle school, from Grades 6 to 8, the curriculum describes concepts related to climate change with varying levels of clarity. For example, the Grade 6 geography textbook mentions climate change concepts in eight chapters, with four chapters giving explanations of some related concepts like latitudes and longitudes, domains of earth, major landforms and natural vegetation. However, the connections between these topics

As students progress to higher grades, their textbook discussions of climate change should also become more comprehensive to stimulate learners' increasing levels of understanding.

and climate and climate change should also be added through explanations of topics like the atmosphere, weather, glaciers, flora and fauna, which are already covered in these chapters.

Eight of the sixteen chapters in the science textbook for Grade 6 mention or explain concepts related to climate change, but by making very limited connections with climate change itself. For instance, the chapter on plants covers photosynthesis, transpiration and the herbarium project, while the chapter on living organisms focuses on their characteristics and habitats, including adaptation and acclimatization. The chapter on water covers the water cycle, floods, droughts and rainwater harvesting, and the chapter on air explains water vapour, oxygen and carbon dioxide. The chapter on waste management covers composting, waste disposal and plastic waste. These topics have direct links with climate change that should be presented in the textbooks and not be taught in silos. For example, photosynthesis is directly linked to climate change as plants absorb carbon dioxide from the atmosphere and convert it into organic matter (biomass) that stores carbon.

Similarly, the Grade 7 science textbook refers to concepts such as land breeze, sea breeze, radiation, water cycle, and the effects of increasing populations on water scarcity. The textbook also discusses the uneven heating of the earth, and explains concepts of weather, climate and adaptation of animals, and water availability in detail.

Meanwhile, all chapters in the geography textbook for Grade 7 mention topics related to climate change, such as climate, weather, global

warming, precipitation, natural vegetation, the gradual destruction of forests, etc.

As for Grade 8 students, their geography textbook mentions topics related to climate change, sustainable development, conservation of natural resources, industrial activities and disasters. The textbook also emphasizes water and its conservation, mitigation case study of landslides, wildlife conservation, non-conventional resources and population changes and patterns. Here, it would also be useful to explain their connections with climate change, including the impacts of conventional resources on climate change, the issues of consumerism and of food security arising from population growth, and the need for sustainable lifestyles.

The Grade 8 science textbook mentions vector-borne diseases, plant diseases, the nitrogen cycle and nitrogen fixation. It highlights the exhaustible nature of fossil fuels, including coal, petroleum and natural gas, and their combustion. It should also offer more detailed explanations of their role in greenhouse gas emissions and global warming and its effects. It mentions topics like the causes and consequences of deforestation, which has links with increasing carbon dioxide and impacts like floods, droughts, biodiversity loss, etc. that could also be explained. It also covers various aspects of air and water pollution, the greenhouse gas effect and the Kyoto Protocol. These may be further elaborated for their connections with climate change. It discusses air and water pollution, but related content on their impacts on global warming could be expanded. Recent global agreements (like the Paris Agreement) could also be introduced.



Right: Plastic bottles and containers being re-purposed through art and craft activities. Rachna School, Gujarat.

The English textbook for Grade 8 has a focus on understanding and discussing natural disasters, including tsunamis. Students learn about the devastating impact of tsunamis on coastal areas, and also explore their causes and effects. Through readings, discussions and writing exercises, students gain insights into the tragic consequences of tsunamis and the importance of disaster preparedness and response.



SECONDARY STAGE

There are several topics related to climate change across different subjects in Grade 9 and Grade 10. However, including more comprehensive explanations and connections to real-life examples and current developments would improve climate change education in these grades.

For example, the English textbook for Grade 9 includes a poem called 'On Killing a Tree', which delves into the profound significance and value that trees hold in our lives. While students analyse the poem's language, structure and imagery to understand the poet's perspective on the act of cutting down a tree, they can also actively participate in conversations concerning environmental preservation, the interdependence of ecosystems, and the significance of safeguarding trees and forests, which is imperative to combat climate change.

The geography textbook for Grade 9 mentions government initiatives like the Namami Gange

Programme, which aims to conserve and rejuvenate the Ganges River, and the National River Conservation Plan (NRCP), which is focused on improving water quality in major water sources. The textbook discusses climatic factors like latitude, altitude, pressure and wind systems, distance from the sea, ocean currents and relief features. It covers ecosystem conservation extensively, including a mention of extinct and endangered species.

The science textbook for Grade 9 includes topics related to pure sciences, like microorganisms, and misses out on the opportunity to explain their linkages with climate change (one example, the role of phytoplankton in absorbing atmospheric carbon). It also describes organic farming practices, such as using organic manures, recycled farm wastes and bio-agents, and promoting healthy cropping systems, which expose students to climate-positive actions.

The Grade 10 science textbook covers topics like acids, bases, salts, carbon oxidation and reduction reactions, and the depletion of the ozone layer. It mentions the use of alcohol as a fuel and the efficiency of sugar cane plants in converting sunlight into chemical energy (ethanol). It also highlights the importance of garbage disposal in a scientific manner.

The curriculum for Grade 10 geography includes a mention of the Rio de Janeiro Earth Summit of 1992 and Agenda 21, which aims to combat environmental damage, poverty and disease through global cooperation. Resource planning, conservation of resources, forest

Below: Schoolchildren make paper bags from old newspapers to discourage the use of plastic. Sarvodaya Co-Ed Vidyalaya, Bhogal, New Delhi.





Above: Students learn about the effects of global warming through experiments that monitor temperatures. Rachna School, Gujarat.

conservation, land degradation, biodiversity, ecological conservation and management, water scarcity, rainwater harvesting, non-conventional sources of energy and industrial pollution and environmental degradation are among the topics covered. The curriculum also touches on ancient hydraulic structures in India, drip irrigation and the control of environmental degradation.

In Grades 11 and 12, topics related to climate change are currently included in geography. Unit 4 of the Grade 11 geography textbook delves into a wide range of factors associated with the climate, including crucial aspects like the atmosphere, insulation, pressure, precipitation and world climates. Chapter 11 concentrates on the classification of climates using the Köppen system, exploring topics like the greenhouse effect and global warming, and resulting climatic changes. In Grade 12, Chapter 3 of the geography textbook emphasizes the notion that human development is fostered by the principles of equity, sustainability, productivity and empowerment. Within this context, sustainability measures play a pivotal role and pave the way for effective mitigation strategies.

Given that the science curriculum for Grade 11 and Grade 12 focuses primarily on pure sciences, it does not explore climate science extensively.

The NCERT also develops supplementary material on certain topics for different grades and subjects. It has published some useful supplementary material on topics related to climate change, including on organic farming, water conservation and disaster management. It has also published

project books on environmental education for Grades 6 to 10 and a teachers' handbook on environmental education for Grades 11 and 12.¹

It is clear from the analysis above that various climate change related concepts and topics are already included in textbooks across different grades and subjects. However, they are currently dispersed and inadequate, and several important concepts have not been appropriately discussed, such as carbon removal (sinks/ sequestration), carbon footprints, rising sea levels, glacial melting, various impacts of climate change, climate policies and net zero emissions, various mitigation and adaptation actions, sustainable lifestyles, traditional knowledge, and disaster risk reduction.

As with other ways of acquiring knowledge, in addition to learning from textbooks, learning at school and in formal settings depends on the active involvement and social participation of learners in classroom activities and the approach that teachers take to impart knowledge and explain concepts mentioned in textbooks. This implies three things: the need for updated textbooks; the need for frequently updated teaching aids and learning resources, as climate change is an evolving and dynamic subject and textbooks cannot be updated very frequently to include new information; and the need for relevant teacher training on climate change and pedagogies, to enhance meaningful classroom activities on concepts related to climate change.

¹ <https://ncert.nic.in/desm/env-edu.php>



Climate change is also emerging as a standalone discipline in higher education, with institutions offering dedicated courses – Bachelor’s, Master’s, diploma, Ph.D. and certificate programmes.

Climate change in higher education

In 2003, the University Grants Commission (UGC) introduced a mandatory course on environmental studies at the undergraduate level, in accordance with the directive of the Supreme Court of India. This course included a six-month module worth 2 credits, and it was applicable to all undergraduate-level courses offered by universities and colleges throughout India. In this course, climate change and global warming were taught in Unit 6, which focused on ‘Social issues and the environment’. In 2017, the UGC revised the course to an 8-unit module as part of the Ability Enhancement Compulsory Course (AECC) under the Choice Based Credit System (CBCS).

More recently, in February 2023, the UGC drafted guidelines and a curriculum framework for environmental education at the undergraduate level based on the recommendations of the National Education Policy 2020 (UGC, 2023). Based on these guidelines, the course is being revised to a 4-credit compulsory course at the undergraduate level, comprising 9 units including a dedicated unit on ‘Climate change: impacts, mitigation and adaptation’ (UGC, 2023).

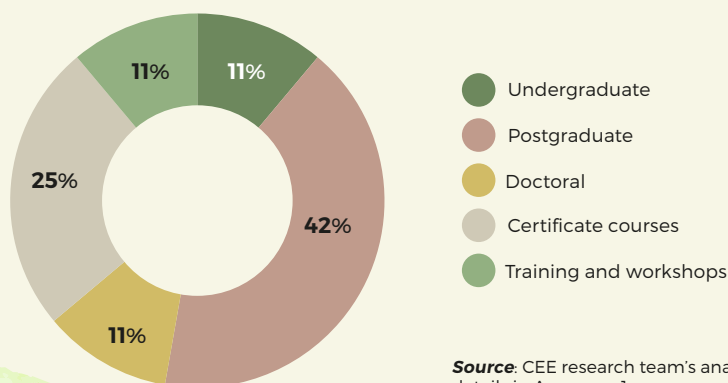
The course also includes 30 hours of case studies and fieldwork engagement, in which climate change can be chosen as a theme for projects.

Climate change is also emerging as a standalone discipline within higher education institutions in India. Some institutions are offering dedicated degree certificates on climate change, while many others have climate change integrated in their environmental sciences and management courses. The dedicated courses on climate change include Bachelor’s, Master’s, diploma, Ph.D. and certificate programmes. Annexure 1 compiles a list of some such courses in India.

At the undergraduate level, the Indian Institute of Technology (IIT) Guwahati, IIT Hyderabad, Ashoka University and Anant National University are some of the universities that offer dedicated programmes on climate change. Postgraduate degrees or programmes focused on climate change are offered by various institutions, including IIT Hyderabad, the Indira Gandhi National Open University (IGNOU), Gujarat University, the Tata Institute of Social Sciences (TISS), The Energy and Resources Institute (TERI), Jindal Global University and Kerala Veterinary and Animal Sciences University. There are also some doctoral programmes focused on climate change, to create credible research in the field, offered by the Indian Institutes of Technology, Indian Institutes of Management, Indian Institute of Science, TERI, Indian Institute of Forest Management, Forest Research Institute, Lovely Professional University, and others.

Many of these institutes are undertaking research on various aspects of climate change, ranging from impacts and vulnerability to mitigation and adaptation solutions in related sectors. There are also dedicated interdisciplinary centres for conducting research and training on climate change in many universities and institutions on both regular and ad hoc bases. Increasing numbers of graded certificate courses or executive courses are also available at some institutes and universities for those who want to update themselves on skills required to tackle climate change. Thus, India has seen a surge in research, training, and educational initiatives focused on climate change, which underscores its commitment to building skills and knowledge at the higher education level to address the complexities of climate change within the country.

FIGURE 11
Courses on climate change in some Indian institutions for higher education



Source: CEE research team’s analysis from a list of 29 institutes, details in Annexure 1



Above: Teacher resolving queries of young children on environment-related issues. Vikram A. Sarabhai Community Science Centre, Gujarat.

Climate literacy in India

Climate literacy entails the acquisition of fundamental knowledge that is crucial for people to understand the earth's climate, the impact of human activities on climate change, and strategies for both mitigating and adapting to it (Mbah et al., 2022). Depending on socioeconomic conditions, general literacy levels and exposure to information and news on climate change, climate literacy in India varies greatly.

According to a survey conducted in India, 54 per cent of 4,619 Indian adults (aged 18 years and above) reported limited or no knowledge at all about global warming (Leiserowitz et al., 2022). Only 9 per cent claimed to have significant knowledge about the subject. The study found that 35 per cent of Indians come across information about global warming in the media at least once a week. When presented with a brief explanation of global warming and its impact on weather patterns, 84 per cent of individuals in India indicated that they believed global warming was occurring. This highlights that while there are many technical terms in the climate change discourse, there is an emergent need to share information and knowledge with all stakeholders

in a jargon-free manner to ensure that citizens are aware of the daily impacts of climate change and also to empower them to come up with solutions to these problems.

Another study on perceptions among urban Indians about climate change shows that they have adequate awareness of the reasons for climate change and associated risks in urban cities (Singh and Mathur, 2019). The authors of this study attribute their subjects' knowledge to the extensive social media outreach by international organizations.

Furthermore, the study notes that the science and environmental education curriculum in schools plays a role in educating the urban youth about the causes and consequences of climate change. However, there appears to be a significant gap in their knowledge regarding ongoing efforts and potential actions to combat climate change. Besides making the term 'climate change' familiar, therefore, there is also a need to ensure comprehensive understanding of what it entails, the current measures in place to address it, and the actions individuals can take to both mitigate and adapt to this pressing issue.



CASE STUDY 3

Greening communities

World's longest running climate literacy exhibition on wheels

The Science Express was a cutting-edge mobile science exhibition mounted on a 16-coach, air-conditioned train that travelled across India between 2007 and 2017 in 9 phases and showcased themes of science, technology, biodiversity and climate actions. It travelled 1.5 million kilometres, stopping at 483 locations across India, reaching over 18.2 million visitors (Sarabhai and Sharma, 2020) including over 3.5 million students and 1.8 million teachers (DST, 2017). Taking advantage of the country's extensive rail network, the train presented a cost-effective, efficient way to reach millions of middle and high school students, including those in remote areas with little access to innovative learning opportunities. The Science Express became the largest, longest running, and most visited mobile science exhibition in India, and has twelve entries in the Limca Book of Records.

In 2015, the year of the Paris Agreement, the Science Express was redesigned on the theme of climate change and was renamed the Science Express Climate Action Special (SECAS). Of its sixteen coaches, eight were dedicated to climate change and showcased information, exhibits, case studies and interactive models on various aspects of climate change (DST, 2015). They focused on communicating the science and impacts of climate change, and India's efforts towards climate change mitigation and adaptation. The SECAS travelled to 64 stations across India from 2015 to 2016 and to 68 stations from 2016 to 2017 (DST, 2017). A comprehensive evaluation showed that participation in SECAS led to increased understanding of scientific facts and the impacts of and solutions to climate change, increased understanding of actions individuals can take to tackle climate change, and increased willingness to act (Sarabhai and Sharma, 2020).

The SECAS exhibition covered various aspects of climate change in a manner that was both interesting and easy to understand. The broad themes covered in the main exhibition coaches were as follows:

- **COACH 1: Understanding climate change.** Insights into the climate as a system, the greenhouse gas effect, and the underlying reasons for climate change, with the key message that climate change is a result of human activity.
- **COACH 2: Impacts of climate change.** How rising temperatures, monsoon variations and rising sea levels are predicted to affect vital sectors such as water, agriculture, forests, biodiversity and human health.

- **COACHES 3 AND 4: Adaptation.** Strategies for adapting to climate change with examples from everyday life; options for urban and rural contexts; and India's adaptation actions.
- **COACHES 5 AND 6: Mitigation.** Methods to reduce the impacts of climate change, with emphasis on restoring balance, enhancing sinks, and reducing emissions by using renewable energy.
- **COACH 7: International negotiations for climate change.** Introduction to the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC), the Kyoto Protocol, the Conference of the Parties (COP) and internationally agreed-upon actions and targets; as well as an explanation of common but differential responsibility.
- **COACH 8: Positive actions.** Recommendations for individual lifestyle changes with this key message: 'Increase your handprint, decrease your footprint'.
- **COACHES 9 AND 10: Exhibition by the Department of Biotechnology (DBT), Government of India.** Covering biotechnology for bioresources and nature conservation, with emphasis on tiger conservation and chemical ecology.
- **COACH 11: Exhibition by the National Innovation Foundation (NIF).** Showcasing select innovations in science and technology and science education, and technological solutions for societal development, including a project that uses augmented reality techniques.
- **COACH 12: Kids' zone.** For children of up to Grade 5 (11 years old) to participate in activities, games and puzzles focused on science, mathematics and the environment.
- **COACH 13: Joy of Science (JOS) hands-on lab.** A space for students of Grade 6 to Grade 10 (12 to 16 years old) to perform experiments and activities that teach concepts of science, mathematics and the environment in an interesting way, as well as a training facility for teachers.

The SECAS was led by the Government of India's Department of Science & Technology (DST) and managed by the Vikram A. Sarabhai Community Science Centre (VASCSC). It was sponsored by the Ministry of Environment, Forest and Climate Change (MoEFCC) and designed by the Centre for Environment Education (CEE).

Actions for climate empowerment in India

Action for Climate Empowerment (ACE) is a term adopted by the United Nations Framework Convention on Climate Change (UNFCCC). It refers to Article 6 of the Convention's original text (drafted in 1992), which seeks to empower all members of society to engage in climate actions. It focuses on six priority areas: education, training, public awareness, public participation, public access to information, and international cooperation on these issues (United Nations, 1992). Implementing these priority areas has been identified as pivotal for everyone to

understand and participate in solving the complex challenges presented by climate change.

The importance of ACE is reflected in other international frameworks, such as the Sustainable Development Goals (SDG 13.3); the Paris Agreement (Article 12, 2015), the Global Action Programme for Education for Sustainable Development (GAP on ESD, 2014); the Aarhus Convention (2011); and the Bali Guidelines on Principle 10 (2010) (UNESCO and UNFCCC, 2016). The table below presents the six elements of ACE, connecting these areas and objectives with education and climate actions.

TABLE 6
The six elements of ACE: objectives and outcomes

Element	Objective	Outcome
1 Education	Change habits in the long term	Foster better understanding of and ability to address climate change and its effects
2 Training	Develop practical skills	
3 Public awareness	Reach people of all ages and walks of life	Promote community engagement, creativity and knowledge in finding climate change solutions
4 Public access to information	Make information freely available, in an understandable manner, to the larger public	
5 Public participation	Involve all stakeholders in decision-making and implementation	Engage all stakeholders in debate and partnership to respond collectively to climate change
6 International cooperation	Strengthen cooperation, joint efforts and knowledge exchange	

Below: Students learning about wind energy in innovative ways. CSI School, Tamil Nadu.

Source: UNESCO and UNFCCC, 2016



Having ratified the UN Framework Convention on Climate Change and the Paris Agreement, India works actively on the six elements of ACE, though it does not report such initiatives under an ACE framework. Major initiatives related to education, training and awareness are detailed in the additional information section

of India's national communication reports to the Convention, with the most recent progress report, the third Biennial Update Report (BUR), submitted in 2021. Table 7 lists some of India's important initiatives on the six elements of ACE, with strong links between education, climate action and community empowerment.

TABLE 7

Some important initiatives in India on the six elements of Action for Climate Empowerment

ACE element	Name of initiative and anchoring agency	Initiatives at the national level
1 Education	National Education Policy of India 2020 (MoE)	Inclusion of climate change in the national curriculum
	National Curriculum Framework for School Education (NCERT)	Introduction of a dedicated interdisciplinary curricular area on 'Sustainability and climate change' in secondary education
	Draft Guidelines and Curriculum Framework for Environment Education at Undergraduate level (UGC)	Integration of climate change education at the undergraduate level within the mandatory 4-credit environmental education course; a dedicated unit on 'Climate change: impacts, mitigation and adaptation' included as part of the course's 9 units, which will be studied by all undergraduate students in India
2 Training	Environment Education, Awareness and Training (MoEFCC)	A central sector scheme built on the principles of the National Education Policy 2020, this programme aims to supplement classroom knowledge among children and young people through experiencing nature and hands-on activities. The building blocks of this programme are psychological interventions for behavioural change, like awareness, enablement, incentivization, modelling, persuasion, training, etc. Such activities are undertaken through networks of eco clubs under the National Green Corps programme; eco clubs and youth clubs under various schemes of the Ministry of Education; youth clubs of the Nehru Yuva Kendra Sangathan; and National Service Scheme cells / units, formed under various schemes of the Department of Youth Affairs, Ministry of Women and Child Development
	Green Skill Development Programme (MoEFCC)	The GSDP was launched in 2017 and offers courses to the youth via the vast network and expertise of the Environment Information System (ENVIS) Hubs and Resource Partners. It offers twenty-five courses, all approved by the National Council for Vocational Education and Training. The programme trains youth participants on green skills in the environment, forest and climate change sectors and assists them to obtain gainful employment and/or self-employment. The courses offered develop technical knowledge and commitment to sustainable development, which will help India attain its Nationally Determined Contributions and National Biodiversity Targets, and abide by the Waste Management Rules, 2016 (see Case Study 4, p. 71)
	Skill Council for Green Jobs (a sectoral skill council created by the Ministry of Skill Development and Entrepreneurship)	The SCGJ was established in 2015 as a society managed by an industry-led governing council. It offers forty-four courses in sixteen thematic areas comprising renewable energy, sustainable development and the environment, and forests and climate change. The council's activities support youth participants in developing green businesses and cutting-edge climate-friendly technologies, with particular focus on renewable energy, sustainable development, green transportation, green hydrogen, green buildings, smart cities, waste and e-waste management and water management (see Case Study 9, p. 114)
	In-service training of teachers on climate change	Teachers are being trained on climate change as part of their professional development through initiatives by the Ministry of Education, including the SWAYAM, DIKSHA and NISHTHA portals. These portals offer self-paced online courses for teachers. These training courses are designed and offered by various autonomous bodies working under the Ministry of Education
	In-service training of government officials on climate change	Every year, a number of nominated in-service officers of the Indian Forest Service (IFS) undergo compulsory training courses on various themes, including 'Forestry and climate change', to give them comprehensive knowledge and skills on issues related to each theme. IFS training courses are offered under the Research and Training Division of the MoEFCC by autonomous bodies and reputed institutes across India

ACE element	Name of initiative and anchoring agency	Initiatives at the national level
3 Public awareness of climate change	Mission LiFE (Lifestyle for Environment) (incubated, curated and piloted by NITI Aayog and implemented by the MoEFCC in a non-linear and non-sequential manner)	Mission LiFE was launched in October 2022. Lifestyle for Environment is a global mass movement to promote the adoption of healthy and sustainable lifestyles based on Indian values and traditions of mindful resource utilization, conservation and respect for nature. It aims to tackle challenges of environmental degradation and climate change through the bottom-up approach of mobilizing change in behaviours and habits at individual and community levels, thus bringing about changes at higher levels (see Case Study 1, p. 29)
	National Programme on Climate Change and Human Health (Ministry of Health and Family Welfare)	This is a national programme, established by the National Centre for Disease Control under the Ministry of Health and Family Welfare, to raise awareness in the general population, vulnerable communities, health care providers and policy-makers regarding the impacts of climate change on human health
	National Mission on Strategic Knowledge for Climate Change (Department of Science and Technology, Ministry of Science and Technology)	Through initiatives under the NMSKCC (one of the missions of the National Action Plan on Climate Change), various awareness, training and capacity-building programmes for target groups were conducted in every state of India. These programmes were implemented by the thirteen state centres on climate change and twelve centres of excellence that were created under this mission
	National Adaptation Fund for Climate Change (MoEFCC, with the National Bank for Agriculture and Rural Development as its national implementation agency)	Thirty projects were sanctioned under the NAFCC across twenty-eight states and two union territories on state-specific climate change adaptation initiatives (with a total outlay of INR 847.5 crores or about US\$102 million). Many awareness, training and capacity-building programmes were conducted for identified vulnerable communities in every state and union territory. Other awareness campaigns on climate change are also being conducted by various ministries, such as the Ministry of Housing and Urban Affairs, Ministry of New and Renewable Energy, Ministry of Water Resources, Ministry of Agriculture and Farmers Welfare, etc.
4 Public access to information related to climate change	Initiatives of the Ministry of Environment, Forest and Climate Change	The MoEFCC publishes various documents and reports, and maintains electronic portals to provide updated information on the environment, forests and climate change. These include: <ul style="list-style-type: none"> • State of India's Environment Reports • India's State of Forest Reports • India's National Communications (NatComs) • Biennial Update Reports (BURs) • Nationally Determined Contributions and other documents communicated to the UNFCCC • A climate change knowledge portal (https://cckpindia.nic.in), which includes lots of information on India's greenhouse gas emissions and various adaptation and mitigation initiatives • Environmental Information System (ENVIS)
	Apps and web content by the Indian Meteorological Department (Ministry of Earth Sciences)	The Indian Meteorological Department publishes weather forecasts and warnings through its websites and mobile apps like the Mausam app for location-specific forecasts and warnings, the Meghdoot app for agro-met advisories and the Damini app for lightning warnings
	Public information on disaster management provided by the National Disaster Management Authority (Ministry of Home Affairs)	The NDMA provides disaster warnings and information on various preparedness and mitigation schemes and resources (disaster atlas, safety measure information, etc.), alert hubs for ten types of natural disasters and twelve sector-specific forecasts. It has a special section for children with information to make them aware of and help them plan and prepare for, and recover from, nine climate-induced types of disasters, including floods, droughts, landslides, cyclones and tsunamis.



ACE element	Name of initiative and anchoring agency	Initiatives at the national level
5 Public participation in climate actions	Promoting sustainable lifestyles under Mission LiFE through collaboration between central and state ministries, departments and allied bodies, and civil society organizations	With the aim to mobilize 1 billion Indians to adopt sustainable lifestyles by 2028 and make 80 per cent of all villages and urban local bodies environment-friendly, a number of public engagement programmes are being conducted by government and non-governmental organizations. As of May 2023, 14.5 million Indian citizens have taken Mission LiFE pledges, 707,000 action events have been conducted and 13,452 citizen LiFE actions have been taken
	National campaigns on various climate actions	The Indian Government has partnered with institutions and local organizations to conduct numerous national campaigns and public participation events. Some key campaigns include the Swachh Bharat Mission, Clean Ganga, Beat Plastic Pollution, Hariyali Mahotsav plantation drives, Earth Hour, Jal Shakti for water conservation, and One Student, One Tree (with 3.5 million saplings planted by students across the country between 2019 and 2020)
	Public participation events on various climate actions	India regularly organizes public participation events across the country to celebrate National and International Days, including World Wetland Day (2 February), World Forest Day (21 March), World Water Day (22 March), Earth Day (22 March), World Biodiversity Day (22 May), World Environment Day (5 June), World Day to Combat Desertification and Drought (17 June), International Tiger Day (29 July), Van Mahotsav (first week of July), Zero Emission Day (21 September), Wildlife Week (first week of October), National Pollution Prevention Day (2 December) and National Energy Conservation Day (14 December)
6 International cooperation on climate change	The MoEFCC steers India's international cooperation on climate change under UNFCCC and other global agreements, conventions, partnerships and coalitions	<p>India has ratified protocols and agreements under the UNFCCC, including the Kyoto Protocol in 2002 and the Paris Agreement in 2015. It sends regular progress reports to the Convention, with updates on India's emissions, climate vulnerabilities and climate actions. India has shown great interest in addressing climate change at the national level in terms of its climate commitments, policy initiatives and promoting climate actions at various levels</p> <p>India has also initiated and is leading international forums like:</p> <ul style="list-style-type: none"> • The International Solar Alliance (ISA), launched in 2016, based in Gurugram. One hundred and fifteen countries have signed the ISA Framework Agreement, of which 93 countries have also ratified the Agreement • International Coalition for Disaster Resilient Infrastructure, launched in 2019. Headquartered in New Delhi with thirty-one governments and eight organizations as members • During the G20 Summit in New Delhi (2023), India launched the Global Biofuel Alliance with eight other countries. The alliance intends to expedite the global use of biofuels by facilitating technology advancements, intensifying use of sustainable biofuels, shaping robust standard setting and certification, and fostering collaboration for the advancement and adoption of biofuels <p>India participates in several bilateral cooperation arrangements on environment and climate change with emerging economies and high-income nations. It also advocates for South-South cooperation between developing countries to promote equitable global development. India is an active member of various international cooperation programmes related to environment and climate change education, like the Asia-Pacific Cultural Centre for UNESCO in Japan and the International Union for Conservation of Nature's Commission on Education and Communication</p>



With more than 100,000 eco clubs across the country, the National Green Corps is playing a significant role in spreading environmental awareness on a large scale.

Above: Young children participate in art activities to learn about nature. The Planet Discovery Centre, CEE, Gujarat.

INITIATIVES AIMED AT GREENING SCHOOLS

Some projects and initiatives in India that aim at greening schools and integrating climate change education into educational systems are:

- **National Green Corps (NGC) by the Ministry of Environment, Forest and Climate Change**

Launched in 2001 with the objective of fostering environmental awareness in young students through its network of eco clubs across schools in India. As part of these eco clubs, students engage with environmental issues within their local contexts. The clubs conduct activities like planting trees, managing waste and conservation, thereby promoting climate change education. Each eco club comprises fifty to sixty environmentally conscious students per school and is supervised by a designated teacher-in-charge. A district implementation and monitoring committee oversees the programme at the district level, including training the teachers-in-charge and periodically monitoring eco club activities. At the state level, a state steering committee provides guidance and oversight, while a state nodal agency coordinates implementation and organizes training for master trainers. A national steering committee provides overall direction and ensures coordination at all levels.

Every year, through multistakeholder partnerships at national and state levels, over 3.5 million students from Grades 9 to 12 participate in the programme (Shanker, 2023). Currently, with over 100,000 eco clubs across the country,

the NGC is one of India's largest grassroots conservation networks, playing a significant role in spreading environmental awareness on a large scale. (Sarabhai and Joshi, 2018; PIB, 2022a).

- **Green Schools Programme (GSP) by the Centre for Science and Environment (CSE)**

Promotes environmental education and sustainable practices in schools across India since 2005. The GSP focuses on creating awareness, capacity-building and implementing eco-friendly measures within schools to address climate change and other environmental challenges. Students are trained and encouraged to conduct audits of natural resource consumption on school campuses. These audits help schools become effective environmental managers by implementing practical solutions to minimize wastage and conserve valuable resources.

- **The Eco-Schools India Programme by the Centre for Environment Education**

The Foundation for Environment Education (FEE) designed the International Eco-Schools Programme in 1994 following the UN Conference on Environment and Development, also known as the Earth Summit, held in Rio de Janeiro. The primary goal of Eco-Schools is to promote environmental education and enhance awareness about the SDGs among students in Grades 1 to 5. One of the largest global sustainable school programmes, it starts in the classroom and spreads to the community by engaging the next generation in action-

based learning (Eco-Schools, 2023). In India, the programme was formally launched in 2014-15 by the Centre for Environment Education.

Over the years, the programme has extended its reach and scope significantly and is currently active in about 20 states and over 200 schools across the country. Eco-Schools India extends its scope beyond primary school students to include teachers, principals, parents, non-teaching staff (such as ayahs, gardeners and administrative personnel) and occasionally even local administrative officers. It focuses on five themes – water, waste, healthy living, biodiversity and energy – with climate change being a cross-cutting theme. Participating schools are expected to create action plans targeting lasting and sustainable environmental changes within the school campus or extending it to the community.

With the active participation of over 45,000 students and 2,000 teachers in India, the Eco-Schools programme is as an excellent way for schools to embark on a meaningful path towards improving the environment within their campuses and surrounding communities. This initiative not only creates a positive and enduring impact on the lives of children, their families and school staff, but also extends its benefits to local authorities.

• **Green School Initiative by the C.P.R. Environmental Education Centre (CPREEC)**

Recognized as a Centre of Excellence by the MoEFCC, the CPREEC is a Chennai-based NGO that has developed an Education for Sustainable Development (ESD) programme called the Green School Initiative. This programme encourages students to become environmentally pro-active and engage in actions to improve the environmental standards of their schools, reduce the use and wastage of resources, enrich their knowledge through practical experience, and develop personal and social responsibilities for the schools and their environment.

The programme is being implemented through clubs in selected schools in the cities of Chennai, Ooty (officially Udhagamandalam), Puducherry, Hyderabad, Bangalore and Mysore. The programme is implemented using a club approach.

CPREEC has also been conducting a series of awareness programmes on climate-friendly diets among school students to sensitize the younger generation to the realities of modern meat production and dairy farming and their impacts on the environment, and to foster kindness to animals.



Right: Students perform a skit on the harmful effects of deforestation on the future. Rachna School, Gujarat.



Above: Through her drawing, a young girl shows that the future of the earth is in our hands. Sarvodaya Co-Ed Vidyalaya, Bhogal, New Delhi.



Greening curriculum

FORMAL EDUCATION

India's National Education Policy 2020 provides a vision of its education system that includes major recommendations envisaging an education system sensitive to the environment and its sustainability, with a deep sense of rootedness in India's environment-friendly traditions and culture (MoE, 2020). The NEP 2020 recognizes climate change as a vital component of environmental education and acknowledges the impact of climate change on ecological and human systems. It also emphasizes the need for skilled professionals, especially in fields such as biology, physics, climate science, chemistry, agriculture, as well as the social sciences, to meet the shift in demand for a workforce needed to address energy, water, food and sanitation issues. It further states that all higher education institutions are expected to incorporate environmental education, including climate change education, in their curricula (MoE, 2020).

In a previous section of this chapter (pp. 56-59), we detailed the process of integrating climate change concepts into existing NCERT textbooks. Here, we discuss the new National Curriculum Framework's emphasis on climate change.

In line with the NEP, the National Curriculum Frameworks (the NCF for Foundational Stage

2022 and NCF for School Education 2023) define learning standards, content, approaches, pedagogies and assessment across stages of education. The stage-wise integration of the environment, sustainability and climate change in school curricula is described briefly below:

Foundational stage (Nursery to Grade 2)

The NCF for Foundational Stage recommends that the curriculum focus on environmental awareness by sensitizing students to the role of trees, water, air and the sun in our lives, and creating a positive bond between children and various elements of nature. For instance, the NCF provides illustrations for stories about flora and fauna, rhymes on the environment, and folklore, local arts and festivals that express gratitude and reverence for elements of nature. It focuses on joy-based learning and is based on pedagogies of activities, toys and storytelling.

Preparatory stage (Grade 3 to Grade 5)

The NCF for School Education has broadened and strengthened the existing curriculum through thematic integration of climate change in different subjects. Students are introduced to biodiversity, the importance of clean water, air and soil, and the consequences of pollution. They are also encouraged to participate in school-level activities for environmental conservation to create healthy habits, and undertake field visits to understand the difference between clean and polluted environments, etc.

Middle stage (Grade 6 to Grade 8)

Multidisciplinary environmental education is to be integrated into every subject and in vocational training. The NCF recommends particular emphasis on experiential learning and critical thinking, with practical training in preventive health and well-being, public hygiene, first-aid, disaster response, etc. Students will deepen their knowledge of ecosystems and the interconnectedness and interdependence of elements in nature, and will understand humans as integral parts of ecosystems. Students should be exposed to real-life case studies of environmental disasters and understand the impact of human activities on the environment (for example, using fertilizers, dumping industrial and domestic waste in water bodies, creating landfills, polluting oceans, etc.).

Secondary stage (Grade 9 to Grade 12)

The NCF provides for students to deepen their subject knowledge and understand the critical links between different factors and issues within their social, physical and biological environments. It mandates a course on environment education for Grade 10 as part of the interdisciplinary (curricular) area. The curricular goal of this subject is to understand key issues and challenges related to climate change, pollution and biodiversity collapse, while students'

competencies and learning outcomes are also outlined in detail.

For Grade 11 and Grade 12, 'Sustainability and climate change' is part of the interdisciplinary curriculum. The NCF describes the design of the discipline as comprising four courses:

- Environmental science (from a social environmental system's perspective)
- Environmental pollution: air
- Biodiversity
- Climate change

Higher education

As explained in the previous section on higher education, the UGC has drafted guidelines to include a mandatory 4-credit course on environmental education, in line with the NEP 2020 (UGC, 2023). This course has 9 units, of which 8 units are classroom-based learning with 46 hours of teaching engagement and the last unit is case-study- and field-based learning, with 30 hours of teaching engagement. It has a dedicated unit on 'Climate change: impacts, mitigation and adaptation', which is a welcome step towards integrating climate change in the curricula of undergraduate courses in India.

These policy documents of the education sector have set out principals and frameworks for education keeping in mind the needs of the twenty-first century, and have integrated

elements of education on environment, climate change and sustainability at various educational stages.

NON-FORMAL EDUCATION

Outside the formal education system, young people in India are being trained on climate change knowledge and skills through various initiatives, some of which are described below:

• Skill Council for Green Jobs (SCGJ)

A sector skill council under the Ministry of Skill Development and Entrepreneurship (MSDE), the SCGJ was incorporated as a society in 2015 and works in the domain of capacity-building for green businesses and cutting-edge climate-friendly technologies. The SCGJ covers the entire gamut of green businesses, with sixteen sectors in three thematic areas, viz. renewable energy; environment, forest and climate change; and sustainable development. The focus of the SCGJ has been to establish a strong link with industry in all its areas of work (see Case Study 9, p. 114 for more information).

• Maharashtra Youth for Climate Actions (MYCA)

A youth programme initiated by UNICEF Maharashtra and the Centre for Environment Education (CEE), MYCA offers three levels of youth engagement for climate change: training on climate action planning; climate action on the field and its reporting; and climate advocacy

Greening teacher training and education systems' capacities

CASE STUDY 4

Green Skill Development Programme

The Ministry of Environment, Forest and Climate Change (MoEFCC) launched the Green Skill Development Programme (GSDP) in 2017, to develop skills in the environment and forest sectors to help India's youth find gainful employment or self-employment.

The GSDP covers various sectors like biodiversity conservation, environmental management and pollution control, renewable energy, energy efficiency, waste management, sustainable agriculture, climate change mitigation and adaptation, sustainable water management, ecotourism, sustainable building designs and sustainable construction. It offers about 25 courses, ranging from 180 hours to 420 hours in duration. All these are certificate courses designed as per the National Skill Qualification Framework and approved by the National Council for Vocational Education and Training.

The GSDP is being implemented via the ENVIS (Environmental Information System), established and operated by the MoEFCC, and ENVIS Resource Partners (RPs) (hosted by environment-related governmental and non-governmental organizations or institutes of profession

excellence) in about 70 centres across India. Around 700,000 young people have been trained through this programme, which focuses on upskilling unemployed youth and skilled enthusiasts with green skills. Gujarat has had remarkable success in teaching young people about renewable energy, with over 70 per cent of those trained under the GSDP now working in the field. Uttar Pradesh has prioritized waste management and water conservation while Karnataka has had success in encouraging sustainable agricultural practices (Das, 2023).

The GSDP aims to develop green-skilled workers with technical knowledge and commitment to sustainable development, which will help to attain India's NDCs, the SDGs, the National Biodiversity Targets, and abide by the Waste Management Rules, 2016 (GSDP, 2022). These approaches towards green skills can become pillars of climate action, climate empowerment and climate justice by helping to reduce carbon emissions and to facilitate adaptation and resilience to climate change through disaster-preparedness, drought-resistant crops and smarter climate insurance.



Teachers are at the core of education and learning, and empowering them with the right information, knowledge, resources and skills has a multiplier effect on the whole education system.

and policy. The MYCA programme is a step towards creating youth representation from Maharashtra to advocate for climate action. It has created huge impact on youth engagement with climate change issues, including successful advocacy to integrate climate change environment lessons in school curricula, being selected for COP27’s young scholar award, and youth engagement and stewardship initiatives spanning 700,000 young people who will be engaged in low-touch action and in reporting on water conservation (UNICEF, 2023a). MYCA has also published numerous handbooks and reports, including a *Teachers Handbook on Climate Change*, *Youth Handbook and Activity Book*, and *Lessons from Maharashtra on Youth-Led Climate Actions*.

• **Movers Programme**

This is a regional movement of youth volunteers to develop awareness about the Sustainable Development Goals (including climate action) and twenty-first-century skills among young

people by conducting localized trainings at the grassroots. It was developed by Youth Co:Lab, an initiative co-created by UNDP and Citi Foundation in 2017. Youth Co:Lab is the largest youth-led movement for social and environmental entrepreneurship in the Asia-Pacific. It was launched in India in 2019. Along with local partners and academic institutions, it conducts workshops for the youth on climate change and other SDGs and empowers them with knowledge, resources, tool-kits and a large youth community network. Trained ‘movers’ go on to train other young people in their communities, thus creating a multiplier effect of actions on climate change and sustainability.

• **Green Education Initiative by the Confederation of Indian Industry**

Works towards integrating environmental sustainability into business and management education. It focuses on equipping college-level students with the knowledge and skills to address climate change challenges in the corporate world.



Greening teacher training and education systems’ capacities

Teachers are at the core of education and learning, and empowering them with the right information, knowledge, resources and skills has a multiplier effect on the whole education system. Through effective training on climate change education, they learn the subject well and are more confident about teaching it using effective pedagogies, classroom discussions and project-based activities. It also helps them to encourage students to act on climate change issues at local levels.

Over the past years, India has focused on building the knowledge, skills and capabilities of teachers

and institutions on climate change, environment and sustainability education, helping them understand climate change and empowering them to act as multipliers of such knowledge and skills. A range of initiatives in India collectively contribute to the enhancement of environmental education and awareness among teachers.

The MoEFCC conducts capacity-building programmes that empower teachers with deeper understanding of environmental issues, including climate change, equipping them with the necessary tools to incorporate environmental education into their teaching methods. Additionally, State Councils of Educational Research and Training in various Indian states offer teacher-training programmes focused on environmental education, sustainable practices and climate change. Eco club capacity-

Below: Teachers present what they have learned during a teacher-training workshop. Rachna School, Gujarat.





Empowering climate action through cognitive and emotional learning

Education has the potential to enable people to understand the causes and consequences of climate change, and to make informed decisions and take appropriate actions to address it. Behavioural research shows that decision-making is a cognitive-emotional process. It is therefore necessary that any intervention to enable appropriate actions for climate change must include cognitive and emotional skills along with academic knowledge to address climate action.

UNESCO's Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) has designed an online interactive course on climate change that adopts the Cognitive Academic Social

Emotional (CASE) approach. The course is digital and uses multiple digital pedagogies afforded by technology that make the course immersive, fun, reflective and action-oriented. It is hosted on UNESCO MGIEP's Learning Experience and Analytics Platform Framerspace and is designed for learners 12 years old and above.ⁱ

A pilot study conducted to investigate the efficacy of the course showed learning outcomes that build knowledge of climate change and mindsets to effect pro-environmental action to mitigate its impact (Deep et al., 2022).

ⁱ <https://www.framerspace.com/course/climate-change?cid=5edd93243a70e651e9f80424>

building workshops, organized by diverse entities, such as government bodies, non-governmental organizations and educational institutions, are valuable platforms for teachers engaged in environmental initiatives in schools, providing training on environmental education and sustainable practices while imparting effective strategies for engaging students in meaningful environmental activities.

Some other initiatives are discussed below:

- **Online course for teachers on climate change by the Centre for Science and Environment (CSE)**

A free online course by the CSE and the Green Schools Programme that teaches climate change holistically, provides various strategies for teaching climate change in the classroom, and serves as a platform for connecting with professional in the field.

- **Green Teacher diploma course by the Centre for Environment Education (CEE)**

The CEE, together with the Commonwealth of Learning, Canada, developed an Open and Distance Learning (ODL) course for teachers on environment education. It was called The Green Teacher Programme and was launched in 2005. It was the first in-service teacher-training programme on environment education offered through ODL in India. The course is a one-year diploma that aims to enable teacher-learners to take up environmental concerns and issues in the classroom effectively and engage students in practical, action-oriented environment education activities and projects. The course has been revised and updated as per the NEP 2020. Post the COVID-19 pandemic, a short-term certificate course is also offered besides the one-year diploma.

In addition, many government platforms provide information and training to teachers on issues

related to climate change. These include Digital Infrastructure for Knowledge Sharing (DIKSHA), National Initiative for School Heads' and Teachers' Holistic Advancement (NISHTHA), and SWAYAM, which aims to bridge the digital gap for students left behind by the digital revolution.



Greening communities

Greening community initiatives aim to foster sustainable practices and environmental stewardship at the community level. These initiatives focus on engaging community members, organizations and institutions to adopt eco-friendly measures, promote conservation and raise awareness about environmental issues, including climate change.

In India, these initiatives include community-driven waste-management initiatives focusing on waste segregation, recycling, composting and reducing landfill waste. Such initiatives involve local residents, self-help groups and NGOs to address the challenges of waste management and promote sustainable waste practices. The Swachh Bharat (Clean India) Mission also encourages community participation in waste management, cleanliness drives and constructing toilets, aiming to create a clean and green environment. Other community-based natural resource management initiatives involve local communities in the sustainable management and conservation of natural resources like forests, water bodies and wildlife habitats. They empower communities to take ownership and responsibility for their natural resources, promoting sustainable practices and biodiversity conservation. Other initiatives promote the adoption of clean and renewable energy, like solar power.

The Indian Green Building Council promotes the construction and operation of environmentally sustainable buildings and communities.

These initiatives encourage the adoption of green building practices, energy-efficient designs, water conservation and waste-management strategies at the community level.

Mission LIFE is a global movement announced by India at COP26 in 2021 to promote sustainable lifestyles and mindful use of resources to conserve the environment (see Case Study 1, p. 29 for more information).

• **Teaching sustainability in an ecologically fragile Himalayan region through local stakeholder engagement**

Plastic pollution has profound effects on delicate Himalayan ecosystem. It also contributes to climate change from emissions throughout its life cycle and by interfering in the ocean's capacity to sequester and absorb carbon dioxide.ⁱ Ecosystems like oceans and mountains are particularly vulnerable to both climate change and plastic pollution, and a combination of both is a significant stress on biodiversity (Geneva Environment Network, 2023). It also

leads to water and soil contamination.

Nestled in the majestic northern Himalayas at 3,000 m, the Jalori Pass (Himachal Pradesh) experienced a surge in plastic pollution due to increased tourism and inadequate waste management. Earthling First (OPC) Private Limited took on the challenge of establishing a sustainable waste management model in the region. The project was initiated in September 2020 and implemented in collaboration with the local rural community, businesses and authorities. It used an information, education and communication (IEC) strategy combined with a systems-thinking approach. The project emphasized the importance of education to ensure that locals could sustain these waste management efforts without external assistance (Bhagat, 2022). The project was awarded the Indian Responsible Tourism Award in 2022. In 2023, the project entered its final phase, which encompasses coordination, supervision, monitoring and evaluation.



CASE STUDY 5

Greening communities

State-wide greening community initiatives in Sikkim

Sikkim is a state with many firsts when it comes to green policies. Decisive, consistent and rigorous efforts by the state government and full public participation have made Sikkim the greenest, cleanest and most environment- and climate-conscious state in India. Some of Sikkim's most successful initiatives in this regard are listed below:ⁱ

- Way back in 1998, Sikkim become the first Indian state to ban disposable plastic bags, and it is also among the first to target single-use plastic bottles. Additionally, in 2016, Sikkim took two major decisions. It banned the use of packaged drinking water in government offices and government events. Second, it banned the use of disposable Styrofoam and thermocol plates and cutlery in the entire state in a move to cut down toxic plastic pollution and tackle its ever-increasing garbage problem.ⁱⁱ
- In 2003, Sikkim became the first Indian state to aim to become fully organic, and 75,000 ha of land were converted to organic farming with no use of chemical fertilizers and pesticides. With strict regulations and public participation, all the food produced in Sikkim became free of pesticides. The state's organic farming policy was awarded the Future Gold Policy Award 2018 by the World Future Council in partnership with the Food and Agriculture Organization.
- Sikkim launched its State Green Mission in 2006 to integrate people with nature and invoke mass support for the cause. It outlined thirteen distinct objectives around greening, afforestation and reducing encroachment in reserved areas, with the aim to promote ecotourism,

conserve the genetic diversity of its flora and fauna, reduce surface run-off, increase local precipitation, reduce temperatures and noise pollution, and attract local biodiversity.

- The Ten Minutes to Earth mission was launched in 2009, by which, every 15 July, Sikkimese people plant saplings at 10.30 a.m. The idea was promoted by the slogan 'One Person, One Tree, One Time'. On the first such event, in 2009, 610,694 saplings were planted throughout the state in ten minutes, creating a world plantation record.
- In 2014, the Sikkim State Council of Climate Change was set up and Sikkim also became the first state to carry out micro-level climate-change-related vulnerability assessments of rural communities.
- Sikkim became India's first state to become open-defecation free in May 2016.
- *Mero Rukh Mero Santati* (My Tree My Child) is another green initiative of the Sikkim government, launched in February 2023, that aims to plant 100 trees for every newborn child in Sikkim (Government of Sikkim, 2023).
- Sikkim is setting up a Climate Change Impact and Mitigation Commission to study the likely impacts of climate change and to suggest short-term and long-term preparatory strategies and mitigation policies.

ⁱ <https://www.sikkim.gov.in>

ⁱⁱ <https://www.unep.org/news-and-stories/story/how-indian-state-sikkim-working-end-plastic-pollution>



Above: Farmers wash freshly harvested celery. Kookalthorai, Tamil Nadu.

INDIA'S CLIMATE-FRIENDLY TRADITIONS

India is home to deep knowledge and extensive practice in a variety of disciplines and fields from literature to mathematics, philosophy to art, grammar to astronomy, ecology to medicine, architecture to agriculture, ethics to governance, crafts to technologies, psychology to politics, literature to music, and economics to education (NCERT, 2023).

This rooted knowledge enriches India's education systems, both formal and non-formal. The approach to environmental education in India is also deeply enriched by the range of nature conservation traditions practised across India. In times of changing climate and environmental degradation, when the world is striving to popularize technological solutions, these Indian traditions offer simple yet effective solutions to climate change that are proven through the ages.

Some examples of such climate-friendly Indian traditions are:

- **Food systems and habits**
India has many sustainable, climate-friendly and conservation-centric food systems and habits inherited from age-old traditions. Eating locally grown and seasonal produce, as well as preventing the waste of food, has been an accepted practice in Indian society (CEE, 2015).
- **Natural ways of food preservation**
Various types of local fruits, vegetables, leaves, stems, roots, seeds, etc. are preserved without refrigeration by sun-drying, pickling or fermenting.

- **Cooling water naturally by storing it in traditional earthenware**

Many Indian households use a traditional earthenware pot to store drinking water. It keeps water cool naturally, thus offsetting the need for refrigeration or use of electricity.

- **Traditional agricultural practices**

India's traditional agricultural practices have been sustainable and emission-free. Organic farming, use of manure, bio-fertilizers and bio-pesticides, crop diversification, supplementing crops with fodder crops or aqua-culture to provide food security, integrated farming, farm ponds and water harvesting techniques, planting drought tolerant crops and seed varieties (seed-banks), use of animal draught power for cultivation and transportation, natural ways of crop storage, etc. are some examples of India's traditional agricultural practices.

- **Step-wells**

Step-wells were traditionally built in arid and semi-arid regions of the country like Gujarat and Rajasthan to recharge and store rainwater deep under the ground, and prevent surface run-off and evaporation. The rainwater flows down through ingeniously designed structures and intricate steps and is stored in underground reservoirs or chambers. Step-wells allow for efficient water collection and makes it available to communities over long periods of time.

¹ Ninety-nine per cent of the plastics we use today originate from fossil fuels (UNDP, 2022). Plastics leave a significant carbon footprint and emit 3.4 per cent of global greenhouse gasses, which came to 1.8 billion tons CO₂ eq. in 2019 (OECD, 2023b). Extracting, refining and manufacturing plastics are all carbon-intensive activities (90 per cent of emissions happen here) and incinerating plastic waste releases significant amounts of greenhouse gasses into the atmosphere, alongside toxic pollutants. Recycling plastic also come with its share of greenhouse gas emissions (Geneva Environment Network, 2023). Plastic in the oceans may also interfere with the oceans' capacity to absorb and sequester carbon dioxide, thus creating another way by which plastic pollution contributes to accelerating climate change.



Above: Women from a self-help group harvest solar energy to dry herbs. Vadali, Gujarat.

They also regulate temperatures in surrounding areas and recharge ground water, while also acting as community gathering spaces. Stepwells hold architectural and cultural heritage besides proving to be climate-resilient water management strategies that help communities adapt to changing precipitation patterns and ensure stable water supply.

- **Maximizing use of solar and wind energy**
Natural and non-conventional solar energy is used in Indian households for drying cloth, spices and other food items, boiling vegetables, lentils and rice, etc. Traditional architecture makes most use of natural sunlight to minimize the need for electric light and adopts architectural techniques that minimize the use of air-conditioning.
- **Textile, clothing and lifestyle**
Textile in India had traditionally been handmade, and khadi cotton is still among the most preferred textiles. Recycling and reusing cloth for other purposes is also part of India's clothing and lifestyle system, which shows the way to reducing greenhouse gas emissions (CEE, 2015).

GREENING COMMUNITY INITIATIVES BY YOUTH-LED INDIAN ORGANIZATIONS: PROMOTING CLIMATE EDUCATION, JUSTICE AND ADVOCACY

- **Indian Youth Climate Network (IYCN)**
The IYCN is a youth-led organization in India that is dedicated to addressing climate change and promoting environmental awareness. Established in 2008, its primary objective is to empower young individuals with the necessary skills and knowledge to participate in environmental initiatives at different levels, from local to international. The IYCN was founded in response to the lack of representation of Indian youth in global climate negotiations. Its projects include Agents of Change, the Climate Solutions Road Tour, Climate Leadership Program, and Rural Energy Project. It has also developed valuable resources like a 'Circular economy toolkit for youth'. Additionally, the IYCN has actively participated in international conferences on climate change, such as the UN Climate Change Conferences and the Local Conferences of Youth, where it has played a crucial role in driving positive change and proposing solutions (Indian Youth Climate Network, 2023).

Additionally, the IYCN hosts a podcast called 'A circular revolution', in which it interviews influential agents of change selected by the network. The podcast showcases significant efforts by the Indian youth in advancing sustainability and innovation in the circular economy. The IYCN receives support from renowned organizations like the EU Resource Efficiency Initiative, Maharashtra Youth for Climate Action, UNICEF Maharashtra, and UNICEF India (Indian Youth Climate Network, 2023).

- **The ClimAct Initiative (TCI)**

TCI was founded in 2022 by a group of motivated young individuals. TCI employs a comprehensive and interdisciplinary approach to empower youth and local communities as agents of societal change. Through initiatives like Green Warriors and Mind the Gap, TCI focuses on climate education tailored to local contexts, mentorship for environmental action, and educational sessions on social and environmental issues. In 2023, TCI organized an intersectional climate education boot camp in Ukhum, Manipur, targeting students aged 13 years to 16 years, aiming to enhance their

understanding of climate issues while building the capacity of local volunteers to sustain the students' involvement. TCI also facilitates community-building spaces through regular 'Earth Talks' sessions on its digital platform and organizes 'Listening Circles' to promote awareness and knowledge-sharing and address eco-anxiety.

- **Youth for Climate India (YFC)**

A youth-driven climate movement that focuses on educating and mobilizing young individuals to prioritize climate justice within social and political domains. The movement is dedicated to fostering the development of a sustainable, equitable and resilient future for all. As part of its efforts, YFC organizes frequent webinars and panel discussions to facilitate knowledge-sharing and discourse on interconnected topics related to climate change. Additionally, YFC has developed a resource bank comprising training materials, guides, worksheets and other resources created by its members and supporters. The purpose of this resource bank is to provide essential knowledge and skills to young organizers, marginalized communities and those impacted by the climate crisis in their pursuit of climate justice (Youth For Climate India, 2023).



Climate solutions pioneered by young Indians across diverse sectorsⁱ

The launch of the climate campaign 'We The Change' by the United Nations in 2021 sought to highlight innovative, sustainable and equitable climate solutions developed by seventeen young people from various regions of India. These youth were recognized for their groundbreaking work in various sectors such as renewables, forest management, environmental education, financing, climate entrepreneurship, sustainable agriculture, disaster risk reduction, ecosystem restoration, water conservation and waste management. Their contributions demonstrated a firm dedication to addressing the challenges of global warming and promoting sustainable practices in the country. These are some examples of their initiatives:

CLIMATE AND ENVIRONMENTAL EDUCATION

Heeta Lakhani, a climate educator, is the architect of the Green Warriors initiative that focuses on climate education. Starting locally with students in nearby schools, she expanded her involvement globally through YOUNGO, the youth constituency of the UNFCCC. Her international engagement began after attending the UN Climate Change Conference (COP21) in Paris in 2015.

EMPOWERING CLIMATE START-UPS THROUGH CUTTING-EDGE DATA TECHNOLOGIES

Neha Shivaji Naikwade, a global policy, diplomacy and sustainability fellow, is a mechanical engineering

professional and co-founder of Parvaah, a youth-oriented organization committed to zero-waste endeavours. Neha's notable contributions include the establishment of a climate data program, an innovative initiative that helps start-ups combat climate change using advanced technologies like Artificial Intelligence-Machine Learning (AI-ML), big data and advanced climate modelling.

ECOSYSTEM RESTORATION THROUGH CLIMATE EDUCATION

Akhilesh Anil Kumar, 21, is managing director of the Bring Back Green Foundation, a non-profit organization dedicated to addressing climate change. The foundation focuses on promoting climate education to mitigate climate change while also addressing topics related to gender and social justice.

FINANCING AND DISASTER RISK REDUCTION

Siddhartha Sharma from Guwahati, Assam, is the founding curator of the Global Shapers Guwahati Hub, an initiative of the World Economic Forum. He is a co-leader of the hub's climate and environment agenda and has worked with diverse communities to provide relief and rehabilitation. His efforts have made a positive impact on around 10,000 individuals affected by floods.

ⁱ Outlook India, 2021



Above: Children's curiosity is satiated through a nature walk. The Planet Discovery Centre, CEE, Gujarat.

Pedagogical approaches to enhance climate change education

Climate change education cannot depend on presenting facts and using traditional textbook teaching methods alone. It is essential to embrace other pedagogical approaches that engage children and society at large to raise their awareness of potential climate change threats and make them environmentally conscious. Fun and creative approaches to environmental education help foster active engagement, experiential learning, holistic understanding, critical thinking, empathy, long-term behavioural change and future readiness. It is also essential to tailor these teaching methods to suit the unique requirements and cultural backgrounds of any specific country. Some of these teaching methods are compiled here.

1 Field-based immersive learning

Immersive outdoor education, such as nature education camps (NECs), familiarizes students with life challenges and encourages them to take up hands-on experiences that they do not typically encounter in classrooms. It offers students a unique learning experience whereby they can connect with nature and gain first-hand knowledge of local flora and fauna. This understanding of the interconnectedness between human societies and nature helps foster empathy among students by instilling a sense of responsibility towards protecting and preserving the environment.

An example of state-led climate action that aims to raise environmental responsibility and promote sustainable practices among rural students is from the Gujarat State Forest Department, which has been organizing NECs for over four decades. Initially targeting students from all areas of Gujarat, these camps were pioneered by the ornithologist Lavkumar Kachar in 1978-79. These free camps immerse students in nature and teach them about local ecosystems, wildlife and conservation. Each camp accommodates fifty students and five teachers for two to three days and includes activities like guided nature walks, birdwatching, wildlife spotting, nature photography and interactive sessions on environmental topics. Around 900 camps are conducted annually at 22 NEC sites (Gujarat Forest Department, 2023), and the Gujarat government plans to increase the number of camps to 2,000 in the 2023/24 academic year.

In 1982, The Gujarat Ecological Education and Research (GEER) Foundation also initiated NECs to fulfil its primary objective of disseminating knowledge and raising awareness of the ecology of Gujarat. Over the years, it has held over 3,775 NECs, benefiting more than 210,000 schoolchildren and 10,000 teachers (GEER Foundation, 2020).

FIGURE 12
Pedagogies to enhance climate change learning



Source: CEE research team

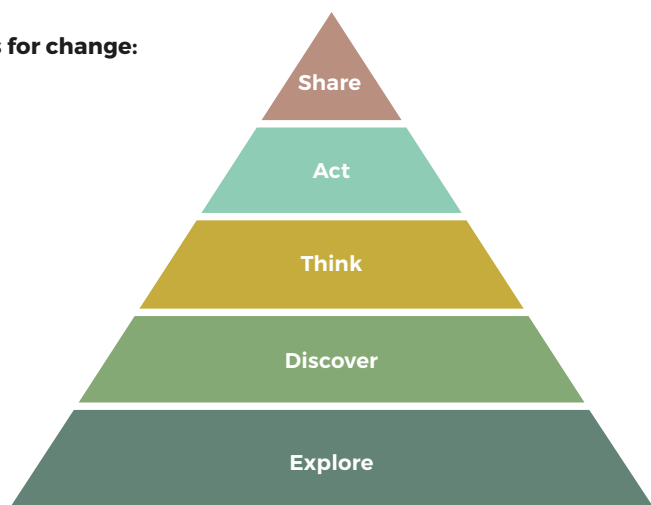
② Project-based and activity-based experiential learning

From a pedagogical perspective, climate change is a challenging topic to teach and to learn, and its complexity offers an opportunity to engage students in higher-order thinking skills (Borhan and Ismail, 2011). Project-based learning (PBL) is a widely recognized approach that fosters critical thinking abilities and cultivates adaptable learning environments that give students the opportunity to learn through practical application and by playing an active role in the learning process. Through PBL, students tackle authentic, real-world problems, leading to deeper understanding and long-lasting knowledge acquisition.

Similarly, activity-based learning is a pedagogical approach that focuses on engaging students in active learning experiences through hands-on activities and group work with real-world applications. It promotes student-centred learning, whereby students play an active role in constructing their own knowledge and understanding of a subject.

One example of an experiential learning programme is a joint initiative of the MoEFCC, CEE and ArcelorMittal called the Paryavaran Mitra Programme (Friends of the Environment), which was launched by the former President of India, Dr A.P.J. Abdul Kalam, on 24 July 2010 in Ahmedabad, Gujarat. As a sustainability and climate change education initiative, the programme grew from a climate change education campaign conducted as part of World Environment Day (5 June) 2008 that aimed to create a network of young leaders from schools across the country to promote socially responsible climate action. Over 200,000 schools are associated with the programme, and it was selected as one of the Good Practice Stories on Education for Sustainable Development by UNESCO in 2014.

FIGURE 13
Young leaders for change:
methodology



Source:
paryavaranmitra.in

The programme focuses on students of Grade 6 to Grade 8 and follows the PBL pedagogy of explore-discover-think-act-share, involving the whole school, and incorporates active teaching-learning methodologies that bring an environmental perspective to concepts and topics taught in the curriculum. The programme recognizes social and environmental action at the individual, school, family or community level that demonstrates positive and responsible behavioural change as making a person a 'Friend of the Environment'. This includes not only students but also teachers, principals, parents, entire schools and members of the public who exhibit these qualities. The projects and actions conducted as part of the programme can be directed towards addressing local challenges or conditions within the school, home or community.

The programme also provides online resource materials to schools to undertake projects focusing on local environmental issues along the five themes of the programme: water and sanitation; biodiversity and greening; energy; waste management; and culture and heritage.

Similarly, there is also activity-based learning that focuses on engaging students in active learning experiences through hands-on activities and group work with real-world applications. It promotes student-centred learning, whereby students play an active role in constructing their own knowledge and understanding of a subject.

③ Gamification

Designing games related to climate change makes the topic more engaging and interactive for students and teachers, and other interested members of the public. Gamification can help learners understand complex concepts and simulate real-world scenarios, and motivates them to learn more about climate change. Such games offer students a tangible representation of environmental issues and help them grasp various concepts of environmental interconnectedness and sustainability.

WEB OF LIFE

This game illustrates the interconnections between the environment and elements of nature, and helps students understand them visually, using simple materials like paper, pens and string.

First, students are asked to make cards representing various elements of nature, such as animals, birds, plants and natural resources. Then, every student is asked to hold one 'element' card and they are all asked to sit together in a circle. Once all the students are settled, they are asked to show the card that they are holding.

The student holding the sun element card begins the game. They are given the ball of string and asked to wrap one end of the string around their finger and to pass the other end of the string to any another student (the 'second' student) who is holding an element card related to the sun. Next, the 'second' student receives the string, wraps a part of it around their finger and passes the end of the string to a third student who holds an element card related to the second student's element.

This process continues, creating a web-like pattern between the students. They are asked to observe the stability of the web, the connections between the elements, and the impact on the connection if any element is removed. The activity prompts discussions about the consequences of disturbing the major elements

Below: Devastated by soil erosion, the web of life breaks down in this role-playing game. Rachna School, Gujarat.

of nature and highlights the existence and significance of these interrelationships.

THE WILDERNESS – AN ECOLOGY-BASED CARD GAME

Developed by the Palluyir Trust, India, this is a distinct biodiversity-focused game featuring indigenous Indian plant and animal species. Throughout the game, players are tasked with constructing harmonious ecosystems within specific habitats while also safeguarding them from being sabotaged by other participants. This game is suitable for both children (10 years old and above) and adults. Its primary objective is to acquaint individuals with regional biodiversity, different habitats and the ecological functions performed by the species inhabiting these environments (Palluyir Trust 2023b).



4 Technology-based learning

Technology can play a crucial role in climate change education for students in India by providing innovative and interactive tools and platforms. Some ways in which technology can enable learning of issues related to climate change include: online resources, virtual simulations and models, data visualization and analysis, online collaboration and communication, mobile apps and gamification, and online courses and webinars. Technology has the potential to make climate change education more accessible, engaging and effective among students. It empowers them with knowledge, critical thinking skills and a sense of responsibility to address climate change challenges and contribute to a sustainable future.

EARTH5R

The Earth5R environmental application, based in India, is an interactive platform that enables users to actively address environmental challenges through on-the-ground actions. It offers a range of activities like plastic waste management, tree planting and tackling pollution issues. The app also works as a unique social media platform dedicated to socio-environmental issues, allowing users to share stories and inspire others. It provides internship and volunteering opportunities to enhance leadership skills and offers rewards like green points for participation. Users can contribute to the Global Environmental Database, maintain a lifelong sustainability portfolio, access an environmental knowledge bank and stay updated on the latest news. Earth5R has been recognized by the United Nations and UNESCO for its environmental initiatives and is being made available in 140 countries with the support of 100,000 citizen volunteers (EARTH5R, 2023).

Disaster management and climate resilience in education

There is an urgent need to prepare children, the youth and communities for impending disaster risks and to make efforts to promote climate-safe schools. Incorporating climate change education within the context of disaster preparedness will help students understand the links between climate change and the increasing frequency and intensity of natural disasters like cyclones, floods, earthquakes and droughts to which India is prone. This approach provides a practical and relevant entry point for climate change education. Students will be able to explore the scientific causes of disasters, analyse their social and economic impacts, and develop critical thinking and problem-solving skills. This interdisciplinary approach will foster a holistic understanding of climate change and its implications.

Further, educating students about disaster risk reduction strategies inherently involves teaching sustainable practices. For example, students can learn about the importance of afforestation and preserving natural habitats to prevent landslides and soil erosion, or the value of constructing earthquake-resistant buildings. Highlighting the relationship between sustainable practices and reduced vulnerability to disasters helps students develop a deeper understanding of the role of climate change in shaping disaster risks. Experts from disaster management agencies can give guest lectures, conduct training workshops or assist in curriculum development. Such collaborations will ensure that the education system is updated with the latest information, best practices and technological advancements in disaster management.

Integrating disaster preparedness and response education also offers opportunities for community engagement. Students can participate in community-level initiatives like mock drills, awareness campaigns and community mapping exercises. Such activities allow students to understand the social dynamics of disaster management, interact with local stakeholders and contribute to building resilient communities. They also help to foster a sense of responsibility and empathy towards those affected by disasters.



Integrating disaster preparedness and response education offers opportunities for community engagement. Such activities allow students to understand the social dynamics of disaster management.

India is ranked 26 out of 163 countries in the Child Climate Risk Index (UNICEF, 2021). The impact of climate change affects the education of children living in natural-disaster-prone areas severely. In view of the impacts of natural disasters associated with climate change on schools and education, there are some policy-level initiatives towards integrating disaster risk reduction and climate resilience in schools across India.

One of the thirty objectives of the National Disaster Management Plan of India is to 'Promote disaster-resilient schools, colleges, and other educational faculties'. The National Disaster Management Plan 2019, released by the Government of India, seeks to tackle increasing disaster risk, exacerbated by climate change, by including three landmark global agreements within it – the Sendai Framework for Disaster Risk Reduction (UNISDR 2015), Sustainable Development Goals (UN 2015) and COP21 Paris Agreement on Climate Change (UNFCCC 2015) (NDMA, 2023).

To build the capacity of schools, teachers and students to fight against such disasters, the National Disaster Management Authority (NDMA), in partnership with twenty-two states and union territories falling in seismic zones IV and V, implemented the National School Safety Programme in 8,600 schools across 43 districts spread over these states and union territories. Its aim was to sensitize children and school communities to disaster preparedness and safety measures. The project was operational from 2015 to 2019 (NDMA, 2023).

There are many states in India that have to face natural disasters and take appropriate action to ensure continuity in learning and prepare students for the future. For instance, the state of Tamil Nadu is prone to cyclones, floods, tsunamis and droughts to variable degrees. Tamil Nadu's recently released State Disaster Management Plan intends to prepare future generations to create a climate- and disaster-resilient state. The plan emphasizes that children are to be involved and prepared for the future. Its lessons on disaster management, which include regular mock drills and training on first-aid, will be taught from Grade 6 to Grade 10 (Tamil Nadu State Disaster Management Authority, 2023).

The state of Odisha lies on the coast of the Bay of Bengal. Although Odisha's coastline comprises only about 17 per cent of India's eastern coast, the state has been affected by nearly 35 per cent of all cyclonic events in India (Odisha State Disaster Management Authority, 2023).

Facing page: A teacher emphasizes the need to go green as she explains environment-friendly activities to young children. The Planet Discovery Centre, CEE, Gujarat.

Droughts are becoming more frequent, more intense and more severe in the state. The State Disaster Management Plan 2023 for Odisha recommends that school and college curricula include both risk reduction and catastrophe preparation. Better preparing residents, who are typically first responders to a crisis, to handle calamities will lessen people’s reliance on the National Disaster Response Force and the Odisha Disaster Rapid Action Force (Odisha State Disaster Management Authority, 2023).

Himachal Pradesh suffers from major geological hazards like earthquakes, landslides, floods, glacial lake outburst floods (GLOF), droughts,

cloudbursts, and cold, frost and avalanches. The state government of Himachal Pradesh has already introduced disaster management, including drought mitigation, into the school curriculum. State universities and other institutes of higher education are encouraged to conduct research on various aspects and issues of disaster management in the hilly state. The Himachal Pradesh State Disaster Management Plan 2017 (updated July 2020) recommends that disaster management plans be created by schools, hospitals and other public buildings that are frequently visited by big crowds (Himachal Pradesh State Disaster Management Authority, 2020).



CASE STUDY 6

Greening Schools

Children’s Convention on Climate Change



The UNICEF Field Office for Uttar Pradesh, in collaboration with the Uttar Pradesh Basic Education Department, Samagra Shiksha Abhiyan and Action Aid, organized a Children’s Convention on Climate Change as part of World Children’s Day celebrations on 18 November 2022.

This convention was the culmination of a week-long campaign on climate change in which 6,000 children from 240 upper primary and composite schools across 20 districts of Uttar Pradesh participated. During the week-long campaign, from 12 to 18 November 2022, the students focused on activities to understand the impact of climate change on health, nutrition, education and disaster risk reduction. The activities were designed by a team of experts on disaster risk reduction and education from UNICEF. They included conducting discussions, facilitated by children, with peers and teachers; poster-making by students; red-flagging extremely unhygienic areas and later converting them to green flag areas; organizing community meetings with villagers and interviewing farmers, shopkeepers, neighbours and the elderly to understand the impacts of climate change on health, education, nutrition and disaster risk reduction. As a result of this campaign, children became aware of responsible climate actions and also expressed a commitment to become vehicles of social change in their families, schools and communities.

To commemorate World Children’s Day, the convention’s goal was to amplify the voices of children as they became more familiarized with the critical issue of climate change as it affects their present and their future. The convention also provided an opportunity and platform for children to present a charter of demands on climate change to the Principal Secretary, Education, of the Uttar Pradesh Government, with a view to escalating the necessary climate actions that they wanted their leaders to implement for their best interests as well as those of the general public.

In their charter of demands, the children mentioned the need to include climate change in the curriculum. They also demanded playgrounds for children in schools, provision of counsellors to ensure mental health support for children, propagation of government schemes for farmers, ban on cutting trees, and adequate arrangements to check water logging and the spread of vector-borne diseases in villages.

Seventeen stories of students who contributed to reducing the adverse consequences of climate change in their homes, schools and communities were compiled as a booklet, *Our Young Climate Warrior*, which was released during the convention.

MEENA MANCH ACTIVITIES ON CLIMATE CHANGE

Meena Manch is a platform in upper primary government schools in Uttar Pradesh for adolescent girls in the age group of 11 years to 18 years. It aims to motivate girls to enrol, attend and stay in schools. Through this platform, adolescents can express their views openly and develop life skills, such as self-awareness, communication, creative thinking, logical thinking and stress management, through various activities.

Building on the learnings from its week-long campaign and convention, UNICEF successfully advocated for state-wide upscaling of the climate change campaign by the 45,000 adolescent Meena Manch platforms in government-run upper primary schools across Uttar Pradesh. Climate change will now be a topic in the annual Meena Manch calendar and children of government schools in Uttar Pradesh will be engaged in activities related to the subject. As part of the initiative, students will be engaged in activities they love, such as games, stories, songs, surveys, case studies, plays, posters, poems, etc. Every year, following the activities, the children will prepare a charter of demands and submit it to the authorities.



Summary

India is implementing a number of policies, programmes and schemes to empower its communities on climate actions, thus contributing to Action for Climate Empowerment under Article 12 of the Paris Agreement. These include initiatives on climate change education, training, public awareness, public participation, public access to information and international cooperation, with strong links between education, climate action and community empowerment.

India has incorporated climate change education into existing NCERT textbooks and, through the revised NCF, aims to integrate climate change as an interdisciplinary subject across all education stages.

The initiatives on climate change education in India are broadly categorized within the four pillars of the Greening Education Partnership: greening schools; greening curriculum; greening teacher training and education systems' capacities; and greening communities.

Fun and creative approaches to climate change education help foster active engagement, experiential learning, holistic understanding, critical thinking, empathy, long-term behavioural change and future readiness. Such pedagogical approaches to enhance climate change learning include field-based immersive learning, project-based experiential learning, gamification and technology-based learning.

Despite ongoing efforts in India, there is a need for more comprehensive and widespread education on climate change and related aspects in schools, colleges and communities across the country. While there are many examples of successful programmes and initiatives, much has to be done to ensure that all students have access to the knowledge and resources they need to protect themselves and their communities from the impacts of climate change.





CHAPTER 4

Challenges for climate change education

This chapter delves into the complexities of integrating climate change education, emphasizing the need to define its scope and local relevance across educational stages. It highlights policy gaps, and challenges in curriculum redesign, teacher training and assessment methods, while addressing climate-related disruptions and insufficient funding for climate change education.

Left: Bright young minds learning earnestly about the environment. Shreyas School, Gujarat.



Challenges for climate change education

As discussed in Chapter 3, climate change education is very much a part of India's formal and non-formal education systems. However, the quality of climate change education in India can be further improved. This chapter explores multiple dimensions of the challenges in this regard, covering a range of issues – from gaps in policies, teachers' training and teaching resources, to gaps in curricula, effective pedagogies, assessment and green skills, and gaps in financing and implementation. These gaps are interconnected and cut across the four pillars of the Greening Education Partnership (GEP).

The education system faces several tangible and intangible challenges, as discussed (see Chapter 2, pp. 34-41). These challenges impact the five guiding pillars of education outlined in the National Education Policy (NEP) 2020 (access, equity, quality, affordability and accountability) in one way or another. Addressing the dynamic nature of climate change poses both current and future challenges when it comes to integrating climate change education across all levels of education, including non-formal education. The effective implementation of the recommendations laid out by the new National Curriculum Framework (NCF) 2023 across India's diverse educational institutions is also a challenge that needs immediate attention.

Below: The concept of global warming is taught to young children in easy-to-understand ways. The Planet Discovery Centre, CEE, Gujarat.



Defining the purview of climate change education

One of the fundamental and recurring challenges of climate change education is how to accurately define it: what is within and outside its scope, and what is suitable for which age group or education stage. As stated earlier, the subject of climate change is multisectoral, interdisciplinary and multifaceted. Moreover, it is largely considered a subset of environmental education or Education for Sustainable Development (ESD). However, all that is part of environmental education cannot be termed climate change education, although the domains often overlap.

Some elements are crucial to climate change education, namely its focus on the causes and impacts of, and solutions to, climate change, and its action-oriented pedagogy. Also, in India's context, the impacts and solutions of climate change need to be taught from the local and regional context, and climate change education will thus vary from region to region.

Other central elements of climate change education include aspects of systems thinking and interconnectedness (of and between human and ecological systems), as well as the social, economic and ethical dimensions of climate change, which go well beyond its purely environmental aspects. Often enough, a forward-thinking approach is also a necessary part of climate change education, which focuses on its long-term consequences and the need to find sustainable solutions accordingly.

Given that our understanding of climate science, climate impacts and the dynamics of climate solutions (including international negotiations, national commitments, technological innovations and climate policies) is evolving, education systems must keep abreast of all developments related to climate change such that relevant and updated information is provided to learners and teachers.

Gaps in climate change policies in prioritizing climate education

Since 2008, India has had a comprehensive policy document on climate change in the form of its National Action Plan on Climate Change (NAPCC). This outlines India's strategic framework for addressing climate change through eight dedicated missions focused on various mitigation and adaptation efforts. However, the NAPCC does not address climate change education except in higher education, to some extent, through the National Mission on Strategic Knowledge for Climate Change,¹ which focuses on climate research, knowledge generation and capacity-building. This means that the NAPCC does not outline explicit measures or strategies for incorporating climate change into India's education system or into other actions for climate empowerment. There may be various reasons for this, including lack of prioritization, limited resources or a focus on other aspects of climate change mitigation or adaptation (UNESCO, 2022).

As part of its commitment to the Paris Agreement, India submitted its Nationally Determined Contributions (NDCs) on climate change to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015

and revised them in 2022. As described in the Chapter 1, the two documents have highlighted India's voluntary commitments to taking climate actions in terms of substituting fossil-fuel-based power and reducing the carbon intensity of India's gross domestic product (GDP) to reduce greenhouse gas emissions and increasing India's forest and tree cover to create additional carbon sinks; while also committing to take adaptation measures to minimize the impacts of climate change and aim for a net zero economy by 2070. However, the NDCs do not explicitly mention education, training and capacity-building as committed action points for enhancing efforts to combat climate change nor is there any mention of climate change education in the documents (see Box on p. 30).

¹ The National Mission on Strategic Knowledge for Climate Change (NMSKCC) promotes research, knowledge generation and capacity-building through twelve centres of excellence (CoEs), twenty-three major R&D programmes, seven network programmes, seven capacity-building programmes and thirteen climate change centres across India (PIB, 2022b).

This is also evident from the fact that while climate action received significant attention in India's budget for 2023/24,² the budget did not specify an amount for climate change education, while a reduction in the budget for environmental education, awareness and training was observed. This allocation decreased from INR 77.13 crores (US\$9.27 million) in 2021/22 to INR 58 crores (US\$6.97 million) in 2022/23 (The Times of India, 2022).

The absence of formal climate change education in the NAPCC does not imply that climate change education is entirely neglected in the country. India has been taking many steps in this direction, as described in Chapter 3 and various case studies in this report. India's National Communications (NATCOMS) of 2004 and 2012, as well as its three Biennial Update Reports (BURs) submitted so far (in 2015, 2018 and 2021), all mention many education, awareness, training and capacity-building initiatives taken in India.

The Climate Change Performance Index (CCPI) shows that India is one of the top-performing countries in taking actions against climate change. India is consistently ranked among the top ten countries in the CCPI, and was ranked eighth in 2023. As per India's climate commitments, India is

on track and taking appropriate actions through its policies to ensure that world temperatures don't rise by over 2°C (Climate Action Tracker, 2021). This momentum can also be leveraged for climate change education.

India's national Action for Climate Empowerment (ACE) strategy, the National Adaptation Plan focusing on climate education and empowerment, and the inclusion of climate change education in India's NDCs will go a long way in providing the necessary priority, guidelines and institutional support to integrate climate change education in climate-related policies. There is a need to complement these policies with effective implementation and also ensure that aspects of climate change education are integrated in all development policies, to give the education component as much importance as climate action.

Below: Best out of waste: art can transform waste into wonder. Rachna School, Gujarat.

² India's 2023/24 budget, announced on 1 February 2023, includes two new schemes on climate change – the Green Credit Programme to incentivize environmentally sustainable and responsive actions by companies, individuals and local bodies; and the Mangrove Initiative for Shoreline Habitats and Tangible Incomes (MISHTI). The overall budget of the Ministry of Environment, Forest and Climate Change in 2023/24 was increased by 24 per cent of the revised budget of the previous year, 2022/23 (Kumar, 2023).





Right: A climate educator speaks about seeds and plants as part of kitchen garden training, Government High School, Tamil Nadu.

Current gaps in education policies and national efforts to mainstream climate education

Climate change was not part of the NEP for 1985 and the NCF 2005, which preceded the NEP 2020 and the revised NCF for School Education 2023. While environmental education was emphasized, there was less emphasis on addressing climate change specifically. Therefore, current textbooks and curricula in India do not include climate change education in formal education systems comprehensively. Concepts and topics related to climate change are mentioned intermittently, making limited connections with climate change and seldom explaining the interdisciplinary nature of the subject, which is especially required in higher grades (see Chapter 3, pp. 56-59). Moreover, teaching resources, teaching aids and teachers' training on climate change are among the biggest gaps in integrating climate change education in classroom interactions.

India's Voluntary National Review on contextualizing the Sustainable Development Goals (SDGs) (NITI Aayog, 2020) presents various aspects of India's progress in improved education outcomes under SDG 4. However, there is no specific report on SDG 4.7, which pertains to sustainability education.

While emphasizing the importance of education as a vital sector of the economy, it is essential to note that in 2022/23, the state and central governments collectively allocated about

INR 7.6 lakh crores (US\$95 billion) to education, that is approximately 2.9 per cent of India's GDP. It is worth highlighting that the allocation for education as a percentage of GDP has remained relatively consistent, hovering around 2.8 per cent to 2.9 per cent since 2015. This allocation falls considerably short of the recommended target of 6 per cent set by the Education Commission in its 1964-66 report, a target that has persisted in successive education policies, including the NEP 2020 (Rao, 2023).

While various stakeholders including government, the youth and NGOs in India are actively engaged in climate change awareness programmes, there appears to be a perceived absence of synergies amongst the stakeholders in climate education initiatives. This underscores the importance of fostering collective action among all key stakeholders to address climate change comprehensively, with an approach that involves national awareness campaigns, information materials, increased and continuous financial support, capacity-building initiatives, improved coordination mechanisms, enhanced monitoring and evaluation systems and policy-integration efforts.

The recently revised NCF for School Education 2023 and the upcoming NCF for teachers' and adult education gives the education system an immense opportunity to bridge these gaps.



Above: A young girl engaging with her climate educator on seeds and plants during kitchen garden training. Government High School, Tamil Nadu.

Challenges for the education system in mainstreaming climate change education

Curriculum

Designing a curriculum that integrates knowledge, skills and competencies related to climate change in an age-appropriate way across fifteen years of school education is a challenge, given the vastness, complexity, regional variability and interdisciplinary nature of the subject of climate change. The NCF for School Education 2023 makes an attempt in this direction. Further, incorporating climate change within the curriculum across different state education boards in different contexts, especially in rural schools, is another challenge.

While climate change is a global occurrence, its impacts manifest locally. Therefore, learners need to be educated and empowered to recognize these local impacts in order to find local solutions to climate change. In this context, curriculum developers face the challenge of creating a relatable syllabus that helps students

see the effects of climate change in their daily lives and enables them to find ways to adapt to it (Chopra et al., 2020).

Furthermore, teachers' unfamiliarity with scientific terms often impedes the integration of climate change education across different subjects, as envisioned by the NEP 2020. Much of the scientific knowledge creation on climate change happens in English. The great diversity in India, not only of languages spoken but also of English proficiency, affects the incorporation of this knowledge in curricula as well as in its dissemination (Vachharajani, 2023). This calls for action to address the linguistic diversity in India and to ensure that all information and data related to climate change and education are available in all Indian languages.



There is a need to create sensitivity amongst teachers about the urgency of addressing the climate crisis.

Teachers' training and capacity-building on climate change

Teachers' training is a crucial element in providing quality climate change education. However, there is a gap between the theoretical knowledge imparted to teachers and the translation of this knowledge to their teaching practice (Singh and Joshi, 2022). There is a need to bridge this gap by ensuring that innovative ways of teaching are also included as part of teacher-training programmes, in addition to the theoretical knowledge imparted to teachers.

There is also a lack of convergence between climate change and environmental education and their relationship with concrete and relevant issues that would enhance teachers' understanding of fundamental concepts and reinforce the importance of the subject. There is a need to create sensitivity amongst teachers about the urgency of addressing the climate crisis. Educational modules for teachers that focus on links between individual behaviour and climate change are more likely to garner acceptance from teachers, possibly improving educational outcomes (Anderson, 2012).

Incorporating such value-based training on climate change in the current programmes of District Institutes for Education and Training (DIET centres), education departments and college curricula is needed at both pre-service and in-service training stages.

Teaching resources and teaching aids

The systemic limitations of current schooling impede the incorporation of climate change education and the development of teaching and learning materials. These limitations include lack of basic infrastructure facilities in schools, high pupil-teacher ratios, and the many responsibilities that teachers have, which lead to their lacking time, all of which contributes to resistance against updating teaching resources for effective climate change education and against their use (Singh and Joshi, 2022; Tikly, et al. 2020). To address these limitations, there is a need to take immediate action to support the education system. First, accurate and validated textbooks and teaching resources on climate change must exist; second, they must be affordable and available in all Indian languages; and third, they must be updated continuously. The importance of making quality teaching and learning materials and resources available cannot be overstated given the difficulty of finding reliable sources to teach climate change. It becomes even more important when there is a lot of material on the internet that may be overwhelming and confusing, or worse, incorrect and misleading.

Updated textbooks, teachers' handbooks, teaching and learning materials (TLMs) require investment. Lack of funding and resources for schools deters them from investing in teaching resources and teaching aids to support climate change education, which, in turn, leaves little room for knowledge-building and creativity among teachers.

Finally, the impacts of climate change may themselves impede effective teaching of the subject, especially due to lack of physical infrastructure such as air-conditioning and ventilation in schools to help students withstand extreme heat and humidity (Kagawa, 2022).



Right: Teachers' training workshop on climate change. Rachna School, Gujarat.

Misconceptions about climate change

Climate change is a widely discussed subject in scientific, political and public spheres. It is complex and confusing, so several misconceptions about climate change persist. These circulate among students, young people and even adults through various channels. International and national agencies

are making many efforts to raise awareness about climate change at every level so as to educate society and build support for urgent climate action. Below are some common misconceptions about climate change, along with explanations of why these are wrong.

MISCONCEPTION
Climate change is nothing new. The climate has always changed.

— EXPLANATION —

While it's true that the earth's climate has naturally fluctuated over millions of years, the current rate and extent of climate change are unprecedented in recent history. Human activities, such as burning fossil fuels (coal, oil and natural gas) and deforestation, are primarily responsible for the rapid changes we're experiencing. These activities release greenhouse gases like carbon dioxide, methane and nitrous oxide into the atmosphere, resulting in the rise of greenhouse gas (GHG) concentrations

in our atmosphere. Today, the concentration of GHGs in our atmosphere is the highest in over 2 million years. Consequently, more heat is trapped, causing the earth to become warmer than usual.

Our planet is now approximately 1.15 °C warmer than it was in the 1800s (United Nations, 2023) and 2015 to 2022 are the eight warmest years on record (World Meteorological Organization, 2023). So, while climate change is a natural process, the current rate of change is alarming, demanding immediate action.



— EXPLANATION —

The ozone 'hole' made by the thinning of the ozone layer was caused by the release of chlorofluorocarbons (CFCs). This led to more ultraviolet (UV) rays coming through the atmosphere with effects such as skin cancer. This is different from the greenhouse effect. However, ozone depletion and climate change do have links, with human-made chlorine and bromine gases causing ozone loss in the lower stratosphere

and cooling the earth's surface. Conversely, ozone increase in the troposphere due to pollution warms the surface, adding to the greenhouse effect. Modern fluorinated compounds, used as alternatives to CFCs, can be up to 1,430 times more potent than carbon dioxide as greenhouse gases. While efforts to repair the ozone layer are ongoing, the use of these compounds contributes more potent greenhouse gases to the atmosphere, potentially exacerbating the climate change issue.

MISCONCEPTION
The ozone 'hole' and depleting ozone is the principal cause of climate change

MISCONCEPTION
It's only a few degrees!



— EXPLANATION —

Daily temperatures vary by several degrees as do those between summer and winter. But if our bodily temperature goes up by a few degrees we fall sick. Every 'system' on earth has an optimum temperature range within which it functions well. The human body functions well at a body temperature of 37 °C (98.6 °F). If this temperature rises above 37.7 °C (99.9 °F), we get fever and we can't function well. Similarly, the global mean surface temperature of the earth is 15 °C and even a slight increase alters its normal functioning and has

profound effects on ice sheets, sea levels, local climate and weather patterns. Even a few degrees of warming can disrupt a previously stable climate system, leading to unprecedented changes impacting the earth's natural and human systems.

The global average temperature has already risen by 1.1 °C, and the IPCC predicts that at 1.5 °C of warming, 14 per cent of the earth's population will face severe heatwaves every five years. This will rise to 37 per cent at 2 °C. At 2 °C of global warming, extreme heat will cross critical tolerance thresholds more often, with devastating impacts on agriculture, biodiversity and human health. Water scarcity, extreme precipitation, droughts, extreme temperatures and loss of species and extinctions have been predicted at different scales in different regions under the two scenarios of global warming (IPCC, 2018).



MISCONCEPTION

Global warming isn't real, as it still gets cold!

EXPLANATION

Many people think climate change only leads to warmer temperatures. While it is true that global warming is causing the earth's average surface temperature to increase, rising temperatures is only the beginning of the story.

The earth's climate is a 'system' in which everything is interconnected. Therefore, changes in temperature also cause changes in all related aspects of the climate. The consequences of climate change, therefore, manifest differently in different regions, and include unprecedented and erratic climatic events like heatwaves, cold waves, intense droughts, rising sea levels, flooding, melting glaciers and polar ice, forest fires, storms, cyclones, etc. This means that while climate change is a global phenomenon, its manifestations are location-specific and depend upon various factors including geography, ecology, socioeconomy, etc. As a result, some places may witness frequent droughts while other places may see intense and erratic rainfall patterns, or extreme cold waves.

MISCONCEPTION

Renewable energy is expensive

EXPLANATION

As an alternative to fossil fuels, the energy industry has started shifting to non-conventional alternatives like solar and wind energy to generate power. Since 2010, the world has witnessed a seismic shift in the competitiveness of renewable power options and solar energy has experienced the most rapid cost reductions, with costs of newly commissioned utility-scale projects falling 88 per cent globally between 2010 and 2021. This is thanks to continuous technology improvements, greater economies of scale and reduced financing costs for wind and solar power plants. In India, the weighted average cost of electricity from large-scale solar fell 85 per cent from 2009 to 2019. Solar power tariffs in India range between INR 2.5 to INR 2.87 per kWh (USD\$ 0.30 to USD\$ 0.35; IEEFA, 2020), which is 20 per cent to 30 per cent below the cost of existing thermal power plants (ET Energyworld, 2020).

In most parts of the world, electricity from new renewable-energy plants, such as wind or solar, is now cheaper than power from new fossil fuel plants (IRENA, 2022). New onshore wind and solar projects cost roughly 40 per cent less than coal or gas plants built from scratch – and the gap is widening (BloombergNEF, 2022).

MISCONCEPTION

It's too late! nothing can be done about it!



EXPLANATION

It is important to ensure that society does not become anxious due to the rapid changes caused by climate change. It's not too late to do anything about it, but there is a need for urgent and immediate action. Recent IPCC reports stress the urgency of climate action, highlighting a small time-frame to avert severe consequences of climate change. Achieving net zero emissions and limiting warming to 1.5°C remains feasible if there are immediate policies and collective efforts by governments, industries and individuals. Acting on climate change is urgent and the solution is clear: we need to reduce our greenhouse gas emissions in every way possible and take concerted action at all levels. There is also a need for everyone to adopt sustainable lifestyles, sustainable means of transportation, curb consumption and wastage, switch to renewable systems, conserve resources and restore ecosystems, among many other lifestyle changes.

Many governments, organizations, industries and individuals are working on cutting emissions to ensure a future for humans on earth. Every action will collectively make a huge positive impact. The technology exists to reach net zero by 2050, and supportive policy paradigms and behavioural changes can make it possible to achieve a sustainable future.

MISCONCEPTION

The rise of sea levels is exaggerated

EXPLANATION

The current rise of sea levels is not exaggerated and many Small Island Nations and coastal cities are already under threat. The IPCC predicts with high confidence that if global temperatures continue to rise, rising sea level will be unavoidable for centuries if not millennia due to continuing deep ocean warming and ice sheet melts, so that sea levels will remain elevated for thousands of years (IPCC, 2021a). However, sea levels are not rising at the same rate everywhere, for which the two main reasons are ocean dynamics (like El Niño and La Niña) and the earth's uneven gravity field.

Scientists have been tracking sea levels along coastlines using tidal gauges for more than a century. Since the 1990s, satellite measurements have given them an even more complete view of sea levels across the global ocean. These data unequivocally show a rise in sea levels. Moreover, many low-lying areas around the world are already experiencing much faster rates of rising sea levels than the average global rate.

Pedagogy

Lack of motivation among teachers can further impede effective adoption of pedagogies that involve hands-on learning, such as project-based learning (Sharma and Menon, n.d.). For teachers who have been accustomed to lecture-based methods, accepting and adopting different but, as generally proven, more effective pedagogies for climate change such as case-based project work and hands-on learning, requires attitudinal shifts in the way that they have managed their classes thus far.

While there are many innovative pedagogies being tried and tested in India, especially on environment education, they are not being used to explain the contexts and concepts of climate change in classrooms. Popular pedagogies that foster solution-oriented thinking and enable learners to exercise their agency and recognize their role in mitigating climate change and building resilience to its impact are required. More importantly, a teacher's grasp over a subject determines their ability to successfully identify and implement appropriate pedagogies for it (Gbadamosi, 2016). Therefore, the lack of teachers' training and their insufficient understanding of climate change, as discussed above, may further hinder the development of effective pedagogies for imparting climate change education in India.

Below: Students prepare the soil before planting a sapling in a repurposed plastic bottle. ASN School, New Delhi.



Assessing climate change education

Exams and quizzes test knowledge quickly, while alternative assessment methods of evaluating and grading project-based learning involve an investment of time and effort from both teachers and students. One goal of climate change education is to induce behavioural change in students through project-based, action-oriented learning. Assessing behavioural change in schools remains a challenge. For climate change education to be evaluated during school education, it needs to be seamlessly integrated into learning standards at each educational stage, with specific guidelines on pedagogy and assessments suitable for climate change education. Better ways of assessing climate education, as indicated above (p. 87), need to be introduced, including assessments that focus on action-based learning, systems thinking and empowerment in terms of attitudinal shifts, futuristic approaches and green skills.

Limited avenues for building green skills

One of the primary obstacles to traditional environmental education in India has been the emphasis on knowledge dissemination and awareness-raising, neglecting the cultivation of skills and actionable opportunities. While understanding the scientific aspects of climate change and other environmental concerns is crucial, mere knowledge is insufficient to drive change. Thus, the focus should shift towards practical, experiential learning that empowers individuals with the necessary skills and self-assurance to initiate action.

Increasingly, the growing challenges of climate change are leading industries to mitigate emissions and limit environmental damage, which is leading to increasing demand for green skills (see Case Study 9, p 114). However, existing initiatives to build a green-skilled workforce and to employ it face multiple challenges in India. One of these, as highlighted in a recent report, is the lack of awareness among young people about green job avenues and green skills, which exacerbates the lack of trained workers (Sattva Consulting et al., 2023). The potential of the youth in India remains to be tapped. Making green skills, training and capacity building more accessible will enable young people to choose such careers easily and contribute meaningfully to climate change mitigation.

Moreover, including disadvantaged sections of society, such as the economically and socially vulnerable, persons with disabilities and women, in the green industry is another challenge as these populations are less likely to have access to education and skilling opportunities, and awareness of such opportunities.



Above: An outdoor class in session. Smt. M. A. Jani Jivan Shala, Gujarat.

Displacement and loss of learning due to climate crises

Displacement due to climate change events is a significant and growing problem in India, affecting millions of people every year, as highlighted in Chapter 2. Floods, cyclones and droughts caused by climate change are the primary drivers of displacement in India, causing both temporary and permanent internal migration, which is leading to the temporary or permanent loss of learning opportunities.

The Internal Displacement Monitoring Centre (IDMC) has estimated that India has the third highest number of people displaced due to climate change events in the world, with 2.507 million internal displacements in 2022 (IDMC, 2023, p. 138). Its report states that millions of people in India are forced to leave their homes every year due to floods and cyclones. For instance, Cyclone Asani caused 1,500 temporary displacements to relief camps in Andhra Pradesh between 5 May and 12 May 2022, and Cyclone Mandous caused 9,500 displacements in Tamil Nadu, Andhra Pradesh and Puducherry in December 2022.

Displacement due to climate change events has a severe impact on the education of children of displaced families, causing loss of learning opportunities for children and young people, with damaged school infrastructure and loss of learning materials, peer groups and access to teachers. Moreover, climate change events

worsen the challenge of providing holistic, equitable, affordable and quality education for all, and amplify the existing shortfalls, challenges and vulnerabilities of the education system.

The children most impacted by climate change displacements are also among the most vulnerable to climate change. Displaced children face disrupted schooling, which reduces their access to not only basic education but also to climate change education, which could empower them to face and overcome the impacts of such disasters. Displaced children are more prone to anxiety, depression and post-traumatic stress disorder, which can affect their learning outcomes, leading to a vicious cycle of poverty, inequality and marginalization. This leads to a further increase of their vulnerability to climate change, indicating that incorporation of climate change adaptation within any school education system is much needed (Luna, 2017).

As climate associated disasters strike India each year with greater intensity, they impact the infrastructure, the economy and the livelihoods and education of those affected by these disasters. In such cases, integrating disaster risk reduction and preparedness in school curricula can be a practical and obvious entry point for climate change education. Such an intervention highlights how education can be instrumental in building the knowledge, skills and attitudes necessary to prepare for and cope with disasters, and in helping learners and communities return to a normal life (UNESCO and UNICEF, 2012).

³ The most recent was Cyclone Biparjoy, brewing over the Arabian sea and striking coastal Maharashtra, Gujarat and Rajasthan in mid-June 2023.

From eco-anxiety to climate action: climate positive education

Studies suggest that climate change education for children and the youth should be carefully designed to avoid creating excessive anxiety about climate change. Too much exposure can lead to feelings of helplessness and demotivation (Kefford, 2006; Nicholson-Cole, 2005). The effects of negative climate change impact scenarios on the mental well-being of students in India is a growing concern. According to Kagawa (2022), 70 per cent of young Indian respondents are anxious about the consequences of climate change in the future, which is affecting their emotional health. Balaji (2022) reports that a survey of 10,000 young adults aged 16 years to 25 years, including in India, found that 60 per cent of respondents felt worried, sad, helpless, angry, powerless or guilty about climate change. Four out of ten young adults are afraid of having children because of their concerns about the future of the planet. Such anxiety is known as eco-anxiety, or a chronic fear of environmental doom.

While climate change education should teach students about the science and the threatening implications of climate change, it is as important to cultivate problem-solving and critical thinking skills by emphasizing the individual's ability to achieve positive results (Anderson, 2012). The NEP 2020 has stressed that education in India should include these aspects. A motivational approach, focusing on solutions and values, can improve climate change engagement and foster lifestyle changes that contribute positively towards climate change mitigation (Gifford and Comeau, 2011). Climate change messages, whether in education programmes or awareness-raising campaigns, should promote a sense of self-efficacy and empowerment, encouraging individual action to mitigate climate change (Anderson, 2012).

A study conducted over one school term across twenty-nine primary schools in Australia observed that increased knowledge about climate change leads to more concerns about it (Taber and Tylor, 2009). However, delivering a climate change message that empowers people with effective actions can decrease fear and uncertainty by making them feel more capable of making a difference.

The Indian government is integrating climate change education into the daily lives of people through the LiFE initiative, which requires a significant shift in individual habits (see Case Study 1, p. 29). The Green Skill Development Programme (GSDP) is a government initiative that provides training and skill development to the youth in India to pursue jobs in the green industry (see Case Study 4, p. 71). This programme is just one example of how young people can be empowered to take action on climate change.

Yet, there is much more that can be done to combat climate change. Focusing on actionable solutions and empowering individuals through climate change education offers opportunities to create a more positive

narrative around climate change and to inspire young people to become proactive agents of change. For instance, young people can be encouraged to participate in grassroots movements, such as tree-planting campaigns or beach clean-ups. Additionally, educational programmes should teach individuals how to reduce their carbon footprints and live more sustainably by increasing their Handprint (for more on this initiative, see Box on p. 111).

It is important to recognize that climate anxiety is a growing concern, not only in India but also globally. In Europe, for example, a rising hopelessness among young people regarding climate change is becoming more and more evident, which has led to acts of extreme activism (for instance, blocking airport entrances and private jet runways in Italy, the Netherlands, Sweden and the United Kingdom when COP27 was held in Egypt [Klinkenberg, 2022]). More recently, a month-long protest against climate inaction in Europe led to the shutdown of twenty-two schools and colleges, with protesters occupying educational premises in Germany, Spain, Belgium, the Czech Republic, the United Kingdom and Portugal (Gayle, 2023).

On the more constructive note, many youth activists and groups have led the way for positive, responsible engagement to global climate action. For example youth groups in Austria, Germany and the Netherlands have filed lawsuits against their governments to take more effective measures against climate change (Drugmand, 2023). In India, many young people participate positively in various campaigns, missions and initiatives aimed at spreading awareness and mobilizing actions on climate change mitigation and adaptation. These initiatives range from small, individual actions to large, organized efforts. For instance, the Palluyir Trust for Nature Education and Research works on educating as well as engaging children and young adults on climate change issues through workshops and awareness campaigns with special focus on disadvantaged and underserved segments of the population, such as the rural youth.ⁱ In addition, there are many youth-lead communities on social media curating innovative content on climate change, spreading it through their handles and leading action-driven initiatives (see Chapter 3, pp. 76-77).

Climate anxiety is a real and pressing issue, but also an opportunity for education stakeholders to recognize that young people can be powerful agents and strategic allies in the fight against climate change. By providing them with the necessary skills, attitudes and knowledge, and by empowering them to take action, we can build a more sustainable future for all.

ⁱ <https://palluyirtrust.org/>

Financing climate change education

There is no specific budget for environmental or climate change education, although the NEP 2020 requires that these subjects be taught. There is a need to ensure that climate change education receives funds for relevant components and activities.



To meet the climate action targets under its Nationally Determined Contributions, India requires approximately US\$ 2.5 trillion by 2030; and about another US\$ 10.1 trillion to meet its net zero targets by 2070 (Khanna et al., 2022). India faces a 75 per cent deficit in its total financial requirement to meet its NDCs as per the current track of green finance in India, and domestic sources (public and private put together) continue to account for a majority of India's green finance, at 87 per cent and 83 per cent in FY 2019 and FY 2020 respectively (Khanna et al., 2022). This indicates a need to bridge and scale-up existing climate finance through domestic as well as international funds, and to allocate funds to climate change education.

In India, a majority of funding for education comes from government budgets (both at the national and state levels), multilateral organizations, and corporate funding under Corporate Social Responsibility (CSR). In its Union Budget for FY 2023/24, the Government of India has allocated its highest ever budget to the education sector: INR 1.12 lakh crores (US\$13.66 billion), which is an 8.2 per cent increase from the previous financial year (Hindustan Times, 2023). Sixty-one per cent

of this budget has been allocated for school education and the rest for higher education.

Most of the allocated funds will be used for flagship schemes of education departments (like Samagra Shiksha, PM POSHAN Scheme, New India Literacy Programme, National Means-cum-Merit Scholarship Scheme) and to implement the NEP 2020 recommendations. These include planning and preparing roadmaps, developing resources, improving the quality of teachers, capacity building, innovative pedagogies and textbook design (DSEL, 2023).

There is no specific budget for environmental or climate change education, although the NEP 2020 requires that these subjects be taught. Therefore, there is a need to ensure that climate change education also receives funds for relevant components and activities (like teachers' training, textbooks and additional resources).

Meanwhile, the Ministry of Environment, Forest and Climate Change (MoEFCC), under its scheme for Environment Education, Awareness, Research and Skill Development, has a budget of only INR 87.40 crores (about US\$10.5 million), which is relatively low compared to the ministry's overall

Below: A facilitator explains the impacts of climate change. Gujarat Science City, Gujarat.



budget of INR 3,079 crores (about US\$370.5 million) for FY 2023/24 (MoEFCC, 2023b). It is essential to secure higher funding for such schemes so they also cover dedicated and quality climate change education and awareness.

Disparities in funding distribution for climate change education exist both regionally and globally. Disadvantaged communities and developing countries often face limited access to financial resources for education initiatives, making it challenging to implement comprehensive climate change education programmes. UNICEF and UNESCO are two prominent organizations that fund and support climate change education. For instance, the UNESCO Green Citizens' Programme has identified over 150 local initiatives across 65 countries. These include initiatives that are citizen-driven, innovative, impactful and offer replicable solutions for addressing global warming (UNESCO, 2023d). UNICEF India is working on climate change education in various Indian states. Its projects include interventions around school safety programmes, and disaster risk reduction activities to enhance awareness and knowledge of climate change preparedness and resilience (UNICEF, 2023b).

Most CSR funding in India is routed to the education sector. Between 2016 and 2021, the education sector received INR 29,918

crores (about US\$3.6 billion) of CSR funding (India CSR, 2022). As per an analysis of the top twenty CSR initiatives funding education, these efforts are mostly in the direction of universal and quality education, scholarships, education infrastructure and amenities, digital education and skill development (Fernandes, 2020), while environment, climate change and sustainability education, and green skilling receive inadequate attention.

One of the challenges to financing climate change education is the short-term thinking prevalent in budgeting decisions. Climate change education requires a long-term investment perspective, as its impacts manifest gradually over time. Therefore, to prioritize short-term objectives can make it difficult to secure sustained funding for long-term climate change education programmes (Paulson, 2015). Additionally, climate change is a politically charged topic, and funding for climate change education can be influenced by political agendas and priorities. Shifting political landscapes and changing priorities may impact the availability and continuity of funding for educational initiatives related to climate change. Addressing these challenges requires a multipronged approach, including raising awareness about the importance of climate change education and advocating for dedicated funding (Lindvall, 2021).

Facing page: The world is in our hands: a young boy depicts ways to combat climate change. Rachna School, Gujarat.

Right: The significance of water is reiterated through murals around the school. Sarvodaya Co-Ed Vidyalaya, Bhogal, New Delhi.





Summary

Integrating climate change education is challenging due to its dynamic and interdisciplinary nature. Defining its scope, incorporating local context and tailoring content for different age groups and educational stages are key hurdles.

India's policy initiatives that directly address climate change (such as the NAPCC and updated NDCs) do not prioritize climate change education as a climate solution. It is crucial to integrate climate change education into all development policies to match other climate actions.

Mainstreaming climate change education requires: 1. Redesigning the curriculum, syllabus and textbooks to include age-appropriate climate content, considering regional variability and language diversity; 2. Developing teacher-training modules; 3. Implementing alternative assessment methods; and 4. Meeting industry demand for green skills and promoting inclusivity.

Climate-change-related extreme events disrupt education by displacing students, damaging infrastructure and causing climate anxiety, affecting learners' emotional health.

Insufficient funding, both for the overall education sector and climate change education, poses a significant challenge.





CHAPTER 5

Opportunities for India

This chapter explores India's unique opportunities to address the issue of climate change through education. It highlights the need for policy-driven initiatives, curriculum integration, teacher training, vocational education and collaborative partnerships that have the potential to drive climate education for India.

Left: Young children being introduced to practices like birdwatching and observing nature from a very young age. The Planet Discovery Centre, CEE, Gujarat.



Opportunities for India

Integrating climate change education into India's educational system is driving efforts to build momentum for climate action and collective commitment. Chapter 3 provided a thorough review of this topic, highlighting the potential to enhance climate change education in India, while Chapter 4 elaborated on the existing challenges to scaling up climate change education and explored avenues for improvement.

Despite the challenges, there are promising opportunities to use education as a tool that helps address issues related to climate change.



The process of decentralizing responsibilities and creating a sense of ownership among all individuals in the country can create the necessary change in mindsets to help address the issue of climate change collectively.

This aligns with the pressing need to fulfil India's climate commitments (see Chapter 2, pp. 28-31) and equip learners and local communities with the knowledge and skills needed for disaster risk reduction, and to prepare for and effectively manage climate change.

Some of the most pressing and inherent demands to mainstream climate change in the education sector come from India's commitment to climate actions through its Nationally Determined Contributions (NDCs), long-term low-emission development strategies (LT-LEDS), net zero goal, various national- and state-level policies on climate change, and significant domestic and foreign investments flowing into the climate change sector. This sets the context for India to build on these policy commitments and use education as a medium through which various stakeholders like the youth, communities, students, teachers and the private sector are involved and can contribute towards national objectives. The process of decentralizing





Facing page: Bit by bit: reusing old garments to make a *rangoli* design and critique fast fashion. Rachna School, Gujarat.

Above: A young girl engaging with a variety of local flora and fauna. Sanjeevani Medicinal Garden, Gujarat.

these responsibilities and creating a sense of ownership among all individuals in the country can create the necessary change in mindsets to help address the issue of climate change collectively.

India is actively involved in formulating climate policies, creating mechanisms for their implementation, conducting research and investing in renewable and breakthrough climate technologies. Climate change research in India is enhanced by the contributions of numerous academic institutions, think tanks, grassroots experiences of civil society organizations (CSOs) and industry initiatives.

This wealth of information and best practices on climate actions, including traditional knowledge, can be leveraged by the education sector to build knowledge, skills and capacity among the coming generations, to enable them to contribute to India's climate commitments at

the individual and community level, as well as for personal and professional reasons.

With this impetus in mind, this chapter discusses opportunities to make climate change education stronger and more focused through policies, programmes, curricular and co-curricular approaches, a whole-institution approach, community engagement and partnerships between various stakeholders. Opportunities for mainstreaming climate change education are discussed under five categories: school education, higher education, school to society, community trainings, and building partnerships.

These opportunities cut across the four pillars of the Greening Education Partnership (GEP) – greening schools, greening curriculum, greening teacher training and education systems' capacities and greening community – and pave the way towards greening education in India.



Greening communities

Combating climate change through women’s empowerment and community engagement



Swayam Shikshan Prayog (SSP), or Self-Education for Empowerment, is a Maharashtra-based organization that focuses on empowering rural women in climate-vulnerable zones across seven Indian states through education and entrepreneurship.

Founded in 1998 by Prema Gopalan, the SSP has empowered over 350,000 rural women leaders in 2,320 villages across 7 states, becoming a prominent driving force in rural India for climate change mitigation and adaptation (Swayam Shikshan Prayog, 2023). The organization plays a crucial role in uplifting marginalized rural families through women’s empowerment and leadership. In November 2022, the SSP received the prestigious Local Adaptation Champions Award at COP27 in Sharm El-Sheikh, Egypt.

Its initiatives are primarily focused on four key areas, with a particular emphasis on women’s leadership:

- 1 Women-led climate-resilient farming.
- 2 Women’s entrepreneurship.
- 3 Energy and environment.
- 4 Water, sanitation, health and nutrition.

1 WOMEN-LED CLIMATE-RESILIENT FARMING (WCRF)

The WCRF model, also known as the one-acre farming model, has showcased remarkable transformations by promoting organic cultivation of diverse native crops and encouraging livelihood diversification to ensure household health, nutrition and income security. It aims to uplift marginalized women farmers in climate-vulnerable regions by positioning them as agricultural innovators and decision-makers. Over the past seven years, 65,000 women farmers and households across 750 villages in Maharashtra have adopted climate-resilient farming practices. The model’s success has prompted its expansion to additional districts in Maharashtra, as well as to Bihar and Kerala.

2 WOMEN’S ENTREPRENEURSHIP

Women in resource-poor and climate-vulnerable areas often face barriers, such as limited education, training, resources and entrepreneurial opportunities, which further marginalize them.

Swayam Shikshan Prayog has empowered



The SSP addresses this by providing women with training, mentorship and resources to develop essential business skills and financial literacy, and marketing support. Through connections to larger companies and start-up capital, 40,000 women were launched as entrepreneurs between 2016 and 2020, generating an additional annual income of INR 189 crores (about US\$22.75 million).

3 ENERGY AND ENVIRONMENT

The SSP is empowering women in rural areas through education and the promotion of clean and sustainable energy alternatives, such as biogas stoves, solar products, vegetable coolers, water conservation techniques, organic agricultural inputs and solar-powered milk can chiller plants. The Women’s Entrepreneurship in Clean Energy programme (WPOWER), supported by the US State Department and USAID, is a flagship initiative in this sector. It has produced over 1,000 women entrepreneurs in Maharashtra and Bihar.

4 WATER, SANITATION, HEALTH AND NUTRITION

Positioning women as agents of change, the SSP aims to address the intersectional impact of climate change and gender roles on sanitation, hygiene, health and nutrition in villages. It began in 2007, by training local women health entrepreneurs, known as *arogya sakhis*, to deliver essential health services and products, and raise awareness in rural areas of Maharashtra. Later, it also implemented the Women-led Sanitation, Hygiene and Resilient Practices (wSHARP) project, with support from UNICEF, to promote climate-resilient farming, improved hygiene and sanitation infrastructure, and water resource management. In Osmanabad and Latur districts of Maharashtra, women leaders have engaged with and provided training to 10,000 households on effective water allocation methods during periods of scarcity.

Opportunities to mainstream climate change education in schools

The formal school system plays an important role in reaching out to teachers and students by means of curricula, classroom transactions, activity-based learning and supporting educational resources such as textbooks and teaching aids. Through schools, climate change knowledge and action can be further shared with communities, including parents, neighbours, local institutions like residents' associations and village panchayats, etc. With the introduction of the National Curriculum Framework (NCF) 2023 and implementation of the National Education Policy (NEP) 2020, the education policy and curriculum in India is undergoing a transition that offers great opportunity to further mainstream and strengthen climate change education in schools.

Reorienting curricula and teaching resources with the ongoing revision of education policy and curricula

Based on the NEP 2020 guidelines, the Ministry of Education and the National Council of Educational Research and Training (NCERT) have made a National Curriculum Framework for School Education (NCFSE). The NEP places a strong emphasis on equipping learners

with the knowledge and skills necessary to address environmental challenges, including climate change, and contribute to sustainable development, while also recognizing the need for skilled individuals in fields such as climate science. The NCFSE has eight curricular areas for secondary stage schooling and introduces 'Environment education' for Grades 9 and 10 and 'Sustainability and climate change' for Grades 11 and 12 as disciplines under the interdisciplinary curricular area. It also suggests integrating climate change concepts in middle stage curricula.

This provides ample scope to build climate change education in the school curriculum across grades and subjects. It also provides opportunities to implement a robust curriculum and revise textbooks and teaching resources to integrate climate change across all the educational boards in India – central, state and others.

To support schools and teachers, there is a need to develop and provide educational materials and resources on climate change education while also keeping India's linguistic diversity in mind. This will include supplementary material for teachers to help them teach climate-focused topics, and resources for schools to promote climate action, including posters, booklets, power point presentations and videos to encourage classroom discussions and on-ground action.

Below: A teacher interacting with young students and clarifying doubts. Vikram A. Sarabhai Community Science Centre, Gujarat.





Tamil Nadu Climate Change Mission

Greening communities

In 2022, the Tamil Nadu Government launched the Tamil Nadu Climate Change Mission – a pioneering policy initiative to make Tamil Nadu a climate-smart state. Overseen by the Tamil Nadu Green Climate Company (TNGCC), a special purpose vehicle established to manage this and two other environmental missions in Tamil Nadu, the Climate Change Mission is a set of goals for Tamil Nadu to implement climate change mitigation and adaptation strategies through activities at the district level.

FOCUS AREAS

- Sustainable agriculture and allied sectors
- Coastal area management
- Health and sanitation
- Gender and climate change
- Water resources
- Strategic knowledge and climate literacy
- Enhanced energy efficiency and solar
- Children and youth for climate action
- Forest and biodiversity
- Disaster management and mitigation
- Mission on sustainable habitat and green mobility
- Eco-friendly technologies

The mission encompasses wide-ranging goals in various focus areas, with activities stemming from the environmental context and local and Indigenous communities' inputs from each of Tamil Nadu's thirty-eight districts. A goal that is of particular interest to this report highlights the role of education in addressing climate change: 'Climate courses and curricula in Universities, Institutions, Agencies etc., shall be encouraged under the Mission.'ⁱ

Within this goal are various programmes and activities funded and managed by Tamil Nadu missions that centre around education.

For example, recognizing the potential of young children and the youth in leading the fight against climate change, the Pasumai Pallikoodam Thittam (Green Schools Scheme) has been proposed as one of the programmes implemented under the Tamil Nadu Climate Change Mission.

The Climate Change Mission aims to increase the climate literacy of stakeholders across various sectors through its Climate Literacy Programme. It also aims to increase the comprehensive understanding of climate change among government functionaries, those working in agriculture and fishing industries, students from schools and colleges, as well as self-help groups. Information will be conveyed through a variety of media and Information and Communications Technology (ICT) avenues, including videos, TV programmes, advertisements, radio, Gram Sabhas, pamphlets and posters, and traditional arts. The objectives of this programme are:ⁱⁱ

- To create awareness of the impacts of climate change.
- To understand ways and means to mitigate climate change.
- To educate students on climate science, adaptation and mitigation activities.
- To disseminate best practices and practical solutions to mitigate climate change through media and digital communication platforms like short videos in social media, through apps, etc.
- To create a platform to engage students in climate change awareness campaigns on green days, actively involving them in group discussions, digital poster-making, street plays, skits, podcasts, public campaigns, etc.

ⁱ <https://tngreencompany.com/documents/CCM%20Document.pdf>, p. 43.

ⁱⁱ Ibid, p. 68.

Integration of climate change across subjects / disciplines

Climate change is inherently interdisciplinary, drawing upon various fields of knowledge and expertise to address the complex challenges posed by the climate crisis. It is a phenomenon that is linked to multiple activities, both natural and man-made, with impacts on multiple sectors, and requires diverse expertise to work together towards solutions.

According to the NCFSE, 'The problems of sustainability and climate change are not merely informed by the Sciences, but also by our understanding of Social Sciences and Mathematics. Thus, along with these forms of understanding, engagement with interdisciplinary knowledge becomes an important goal for school education' (NCERT, 2023).

This can help students develop a holistic understanding of climate change and its interconnectedness with different aspects of society and the environment by linking climate change topics with a wide range of subjects. This further supports the push to integrate climate change and sustainability concepts across all grades and subject disciplines.

There can be many opportunities to teach concepts of climate change as part of the different subjects taught in school. These concepts can be translated into subject textbooks, teaching-learning materials, classroom transactions and co-curricular activities in schools. Table 8 provides some ways in which climate change concepts can be related to different subjects taught in schools.

TABLE 8
Teaching climate change through different subjects in school

Subject	Aspects of climate change education
Languages (English / Hindi / Sanskrit / regional languages)	Literature, poetry, essays, debate competitions and reading comprehension specific to climate change, nature and Mother Earth, and the values of conservation and sustainability
Mathematics	Statistics: including examples and questions with climate data and trends. Numerical: calculating averages, percentage increase and analysing variance in temperature, precipitation and greenhouse gas emissions, etc. Mathematical modelling of future climate with differential equations
Physical education / sports	Teaching the significance and practice of yoga and pranayama. ¹ Discussing strategies to promote physical and mental well-being in the face of climate change and emphasizing that physical activity helps reduce individual carbon footprints
Economics	The environment as one of the three pillars of sustainable development, green economy, circular economy, impacts of climate change on the economy, economic indicators of climate change, economics of climate change, net zero economy, economic policies supporting climate actions, cost-benefit analysis, industry transformation
Business studies and accounts	Sustainable investing: integrating environmental, social, and corporate governance (ESG) factors while investing, climate finance, carbon credits, financial and risk indicators of climate change, corporate social responsibility, green businesses
Sociology	Social inequality and climate justice, environment sociology, vulnerabilities to climate change
Arts	Environment-based art and craft, climate-inspired paintings / crafts, sustainable crafts (making fabric bags, best out of waste, etc.), theatre on climate themes
Political science	Acts, policies, missions, schemes and programmes on climate change and the environment, climate governance, different government regimes and their climate policy approaches, the benefits of participative processes for climate policy
Philosophy	Environmental ethics, value of nature and biodiversity, climate philosophy
Co-curricular activities on climate change	Schools can promote climate change issues in debates, declamations, dramas, essays, poetry, recitations, music, poster-making, Model United Nations (MUN), annual functions, climate hackathons, etc.

Source: CEE research team

¹ Climate change threatens physical sports in open playgrounds, especially during extremely cold, hot or

rainy days. Yoga and pranayama can help keep children physically active and healthy even during such periods.



Above: Teachers engage with each other in a teacher-training workshop on climate change. Rachna School, Gujarat.

This approach will foster critical thinking, creativity and interdisciplinary approaches to solving climate problems through inputs from different disciplines. Such an approach will also promote students' capacity to navigate the inherent uncertainties and trade-offs associated with climate action.

Training teachers on climate change

When teachers are given the opportunity to learn about climate change, they will become better equipped to share their knowledge and navigate challenging discussions on climate change, empowering students to engage critically with climate change issues. Teachers' training on climate change can be integrated at two levels: pre-service training and in-service training.

This will also be a timely move as the NEP 2020 has proposed 50 hours of continuous professional development for teachers, head teachers and teacher educators, for which the NCERT has prepared guidelines (NCERT, 2022a). Teachers' education on climate change issues will also be necessary because the NCFSE 2023 for secondary school has outlined a discipline on environment education, with a dedicated unit on climate change impacts, mitigation and adaptation, and on sustainability and climate change, while also integrating concepts of

sustainability, environment conservation and climate change at earlier stages (as described in Chapter 3, pp. 70-72). Thus, there is already scope to bring these changes, and the requisite implementation should be done to train teachers on issues relating to climate change.

There is a significant benefit in training prospective teachers during their Bachelor of Education (B.Ed.) courses by adding climate change modules in the curriculum. Inviting experts and guest speakers from the field of climate change to deliver lectures or conduct workshops can enrich the B.Ed. curriculum as well as teachers' exposure to the subject.

Teachers who are in-service can be trained through workshops conducted by the Central Institute of Educational Technology (CIET) for central schools and District Institutes for Education and Training (DIETs) for state education board schools. In addition, several central government bodies, state governments and non-governmental organizations are also working towards empowering teachers in the field of climate change education. Such initiatives can also be promoted and scaled up by government functionaries, schools, boards and departments, so as to take climate change knowledge, pedagogies and action-based learning to every teacher in more meaningful and effective ways.

Teaching-learning approaches and pedagogies beyond classrooms

The NCFSE 2023 suggests several new formal and non-formal approaches to enable teaching-learning in the environment sector. Teaching climate change is not limited to science or geography, as explained above. Likewise, teaching climate change is not limited to classroom transactions alone. There is scope to engage students individually or in groups through activities like games, action campaigns, debates, quizzes, projects, experiential learning, field trips and school-level eco-friendly actions. Integrating aspects of climate change in co-curricular activities and experiential learning pedagogies offers a huge opportunity to build the required knowledge, skills and attitude for climate actions among students.

Experiential learning and field trips can greatly enhance students' understanding of climate

change and sustainability. Schools can organize field trips to environmentally significant sites like national parks and biodiversity hotspots to expose students to issues of conservation and climate impacts. Students can be taken to visit local government authorities working on urban and rural development, agriculture, water resources, disaster management, etc. to understand local climate issues and adaptation strategies. They can even be involved in developing local adaptation projects like local heat action plans (HAPs) for schools and communities. They can also be taken to renewable energy installations, recycling units and industries to understand sustainable production and its climate links.

Such experiences will help students develop a deeper connection with the elements of natural and man-made systems, and teach them how they can contribute to local-level climate actions.



CASE STUDY 8

Greening schools

Nurturing climate champions in the Nilgiri Biosphere Reserve

In the recent past, climate related disasters have impacted the Nilgiri Biosphere Reserve (NBR) greatly. Disruptions in long-term weather patterns and the fragile ecosystem of the NBR (part of the World Network of Biosphere Reserves since 2002) mean that it is facing the brunt of climate change. The increasing frequency of extreme weather events has led to floods, droughts and landslides in the region, affecting the people and ecosystem alike.

One important way to adapt, mitigate and build resilience to face the challenge of climate change is through climate education, by transforming schools into sustainable green schools. The Keystone Foundation is working to transform climate education in government schools in the NBR, starting with ten schools in the Nilgiris, inspired by the whole-school approach detailed in *Getting climate-ready: a guide for schools on climate action* (UNESCO, 2016a).

The aim is to nurture climate champions through investigative, experiential and project-based learning pedagogy.

Some ways in which the Keystone Foundation is working with schools to promote the active involvement of internal and external stakeholders towards climate action are:

- 1 Teaching and learning** with climate curricula and climate educators' active participation. A priority is given to local contexts by which to explain global phenomena.

- 2 Facilities and operations** that enable the greening of schools' infrastructure. For example, energy efficient lighting, water saving devices, kitchen gardens, nurseries of native plants, waste-management facilities, weather stations, etc.

- 3 School governance.** The involvement of principals and teachers enables decisions on climate actions that are necessary for a school. The involvement of school management committees, with parents understanding the work, would bring more inclusivity. The next step would be to have climate action committees in schools, including the principal, coordinating teacher, student representatives and climate educators, to steer and monitor the school's climate actions.

- 4 Community partnerships.** Involving external stakeholders is imperative for the project to succeed. Partnerships are also important to take climate education beyond the classroom. The Keystone Foundation envisions schools as community climate centres, acting as climate change knowledge hubs. Providing timely weather forecasts and knowledge dissemination on climate-smart solutions and climate resilience through demonstration models in schools will engage communities around schools in conversations around climate.

Through this initiative, the Keystone Foundation foresees that students will become agents of change in society and build a community of climate-aware citizens for the holistic well-being of the NBR.



Above: Students and teachers tilling the soil and planting seeds in the school's kitchen garden together. Government High School, Tamil Nadu.

Facing page: Setting out on an adventure as part of a nature walk. The Planet Discovery Centre, CEE, Gujarat.

Whole-school approach: inspiring actions from schools to communities

A whole-school approach involves climate action in all aspects of operating and managing a school, including school governance, teaching and learning, teachers' training, facilities and operations, and community partnerships. In a whole-school approach, the knowledge students gain about climate change in classrooms is reinforced by the values and actions promoted

by their schools. The active involvement of all stakeholders within and outside a school, including students, teachers, principals, school management, staff at all levels, families and community members, is crucial to implementing a whole-school approach to climate change education and actions successfully.

The whole-school approach has led to the implementation of various environmental projects, such as green roofs, plantation drives, renewable energy applications, biogas production, botanical gardens, kitchen gardens, rainwater harvesting, promoting energy and water conservation, waste management and waste recycling. These activities require the involvement of the whole school and community, and they have a considerable effect in making climate change education more inclusive and cultivating climate-friendly values and attitudes. The process engages every learner to witness and adopt sustainable lifestyles in their daily lives and inspire others in their school, family and community.

Furthermore, schools themselves can act as learning grounds for practising and promoting eco-friendly practices, and can become learning models of sustainable practices. This can be done by implementing climate-friendly initiatives within schools. Students can be made to actively participate in such initiatives, greatly enhancing their learning by doing, and fostering a sense of responsibility and ownership towards sustainable practices.

FIGURE 14
The whole-school approach to climate change



Source: UNESCO, 2016a



Handprint: action towards sustainability



The concept of a carbon footprint is the measure of the risk and negative impacts of emissions and resource consumption. A Handprint, as the opposite of a footprint, is climate-positive action and activity undertaken by students, teachers and schools that brings about tangible and beneficial impacts for the school community and society as a whole. These actions go beyond reducing carbon footprints to also focusing on individual positive behaviours and actions for sustainability in their immediate environment and as a part of their daily lives.

The concern for positive-action-based pedagogy led to the emergence of the concept of Handprint in India. It was developed in an environmental education school programme run by the Centre for Environment Education (CEE). A Handprint symbolizes action for sustainability and is a measure of Education for Sustainable Development (ESD) action that is done individually and collectively to restore the balance

between consumption and the planet's carrying capacity. It therefore indicates a caring attitude and a helping hand for the planet and all life on it (Sarabhai et al., 2022). Handprint was launched in 2007 at UNESCO's 4th International Conference on Environmental Education held in Ahmedabad, India. The Ahmedabad Declaration (Sarabhai et al., 2007) from the conference states, 'Our vision is a world in which our work and lifestyles contribute to the well-being of all life on Earth.'

The Handprint initiative aims to develop key competencies for sustainability education, including systems thinking, normative understanding, collaboration, critical thinking, self-awareness and integrated problem-solving, among young learners (Sarabhai et al., 2022). Its purpose is to empower secondary and high school students and teachers to become agents of change for a sustainable future by actively participating in decision-making processes within society. It also seeks to overcome limitations associated with other environmental education approaches, such as eco-guilt, eco-anxiety, pessimism and apathy.



"Our vision is a world in which our work and lifestyles contribute to the well-being of all life on Earth."

Opportunities to mainstream climate change education in higher education



At the higher education stage, the NEP advocates holistic and multidisciplinary education through flexible and innovative curricula.

Learning climate change at the undergraduate level

The University Grants Commission (UGC) has recently drafted the *Guidelines and Curriculum Framework for Environment Education at Undergraduate level* based on the recommendations of the NEP 2020 (UGC, 2023). The revised undergraduate course on environmental education now covers climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development. The draft course outline indicates that it is to be a 4-credit course (as compared to 2 credits earlier) comprising 9 units, with the first 8 units made up of 46 hours of classroom teaching engagement and the last unit consisting of 30 hours of case studies and fieldwork. One of the 9 units is dedicated to 'Climate change: impacts, mitigation and adaptation', and is to have 6 hours of teaching engagement (UGC, 2023).

At the higher education stage, the NEP advocates holistic and multidisciplinary education through flexible and innovative curricula that include credit-based courses and projects in the areas of environmental education, community engagement and service, and value-based education.

This is a significant opportunity to impart the knowledge, attitudes, skills and mindset required for young graduates and scholars in India to tackle climate change. Through case studies and field work, it also gives an opportunity to engage the youth in working with local communities and relevant stakeholders to understand grassroots issues, look for sustainable solutions for local challenges and contribute to local actions on climate change.

Dedicated degree courses on climate change

Forbes India reports that the manufacturing and transportation sectors in India are looking to fill roles that require green skills, such as sustainability analysts, water waste management experts, solar designers, urban environment impact officers, and environment database administrators (Kaushik, 2022). Such a green-skilled workforce is expected to drive the technological shifts and structure financing

mechanisms necessary to support the country's transition towards net zero emissions by 2070. There is also a need to update the skills of current professionals to enable them to play a key role in this emerging workforce.

Existing traditional industries are also aiming at rapid transition to green manufacturing. Over 138 Indian companies have committed to achieving net zero emissions by 2050 and are gradually hiring a workforce that is technically trained and skilled in climate action to realize this goal (Sattva Consulting et al., 2023). The demand for green-skilled professionals in India will, therefore, grow in the coming years, so as to meet the demands of a greening economy – in sectors like climate research and development, climate mitigation, renewable energy and green hydrogen, climate adaptation, climate risks, loss and damage, nature-based solutions, climate resilience in various sectors (urban and rural planning, construction, agriculture, etc.), climate finance and sustainable investing.

Professional education will play a vital role in building the green skills required to enable industries and businesses achieve green transitions. This creates vast opportunities for higher education institutions in India to come up with courses, programmes and degrees that provides for this demand. Existing professional education institutions are updating their curricula to offer courses and degrees that integrate climate change (see Annexure 1).

Furthermore, there is scope to integrate climate change aspects in courses for lawyers, doctors and chartered accountants to tackle environmental and climate change concerns. For instance, O. P. Jindal Global University offers a Master of Laws (LLM) degree in environmental law, energy and climate change in collaboration with the World Wildlife Fund.² The National Centre for Disease Control is collaborating with medical councils to train medical professionals on the effects of environmental factors like increased heat and air pollution on patient health (Chhopia, 2023). Even within veterinarian education, the Kerala Veterinary and Animal Sciences University offers a postgraduate diploma focusing on the interaction of climate change, sustainability and animal agricultural productivity. Sustainability accounting that measures the costs and risks to the environment from climate change is an emerging practice within traditional accounting, requiring accountants to update their skills (Garg, 2023).

² https://www.wwf.org/about_wwf/enablers/cel/tcapbuilding/llm_programme/



Above: Designing green architecture in a carpentry workshop. CEPT, Gujarat.

Much remains to be done in this regard to make climate change education in India's higher education more focused, systematic and industry-driven, encompassing more disciplines, sectors and functions. Additionally, it should promote international exchange programmes to foster cross-learning and collaboration, share best practices and develop global skills.

Green skilling to support India's net zero transition

India has outlined a bold roadmap to transform itself into a developed nation and a net zero economy over the next few decades. According to a report by Sattva Consulting, the Skill Council for Green Jobs and J. P. Morgan (2023), India has the potential to unlock US\$1 trillion in value by 2030 and an impressive US\$15 trillion by 2070 in its pursuit of becoming a climate-positive economy. This ambitious green transition presents a significant opportunity to create meaningful livelihoods for a large population through the dual approach of leveraging the increasing demand for green jobs and transitioning jobs in traditional industries. The sectors that will drive this green growth and host the highest number of green jobs, especially in urban and peri-urban areas, include renewable energy, waste management, electric vehicles, sustainable textiles and green construction.

Given its large demographic dividend,³ India has the potential to create 35 million green jobs

by 2047 (Sattva Consulting et al., 2023). Thirty-four per cent of India's current population is young and 69 per cent of its population will be of working age in 2030. This presents a huge opportunity for India to develop the green jobs market not just domestically but also globally.

Making green skills⁴ an important part of students' education and training can help build a strong workforce that can cater to emerging trends and job opportunities in the field of sustainability. The Government of India has recognized this need and introduced initiatives such as the Skill Council for Green Jobs, established in 2016, and the Green Skill Development Programme, launched in 2017. These initiatives have been timely and aim to provide knowledge, capacity enhancement and training to the Indian youth in green skills while facilitating employment opportunities in green sectors.

India's National Youth Policy 2021 has recognized that the global issue of climate change is progressing rapidly in India, affecting many sectors including agriculture and jobs (Ministry of Youth Affairs and Sports, 2022). It emphasizes making education systems relevant to the young to prepare them for future jobs.

Addressing climate change requires collaborative actions in the directions outlined above, and calls for efforts from concerned ministries, education stakeholders, expert organizations and civil society organizations to assess the scope and create opportunities.

³ India entered the demographic dividend opportunity window in 2005-06 and will remain there until 2055-56. India's working-age population as a share of its total population is expected to reach its highest level of 69 per cent by 2030.

⁴ Green skills are the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society (UNIDO, 2022).



Greening communities

Skill Council for Green Jobs

India has committed to becoming net zero (nullifying greenhouse gasses produced by human activities) by 2070 at COP26 in Glasgow. In order to achieve this commitment, the Ministry of Skill Development and Entrepreneurship has launched the Skill Council for Green Jobs (SCGJ) with a major emphasis on renewable energy, waste and water management, green buildings, smart cities and green transportation. The activities of the SCGJ are linked to the Skill India Mission, the National Solar Mission,

the Swachh Bharat Mission and the Make in India initiative of the Government of India. It provides quality training to meet industry expectations and promote skill development to drive green business, green energy and environment conservation.

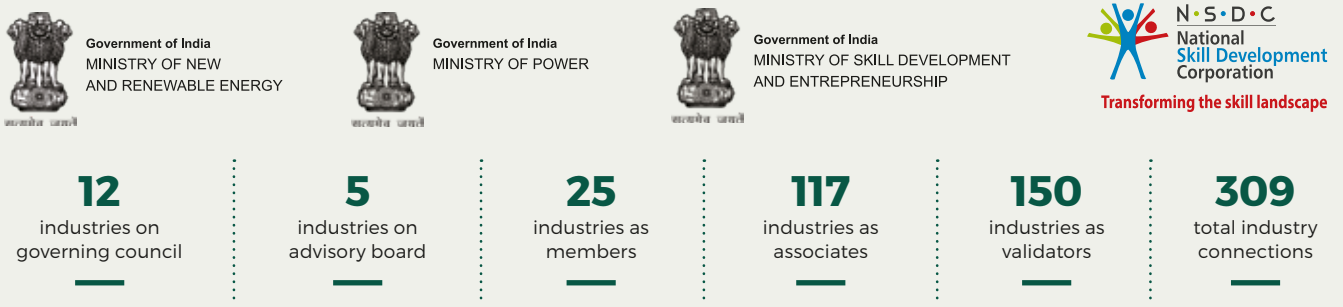
The SCGJ covers sixteen sectors under three major themes: renewable energy (seven sectors), environment, forest and climate change (four sectors) and sustainable development (five sectors).

FIGURE 15
Sectors covered under the Skill Council for Green Jobs



Source: Skill Council for Green Jobs, 2022

FIGURE 16
Industry alliances of the Skill Council for Green Jobs



The SCGJ has allied with various industries to collaborate in the fight against climate change through several initiatives and partnerships. Initial estimates indicate that about 35 million additional jobs will be created in the renewable energy sector by 2047. It is predicted that bioenergy and green hydrogen will generate 0.27 million and 0.6 million green jobs by 2030, respectively. The growth of electric vehicles is projected to generate 10 million direct and 50 million indirect jobs by 2030.

Meanwhile, with rapid urbanization, the amount of waste generated is projected to increase by around 4 per cent annually. Only 28 per cent of waste in India is currently

treated. E-waste and wastewater management are identified as two leading and profitable sectors in waste management. E-waste management is predicted to generate 0.5 million formal jobs in India by 2025, while the wastewater management sector, which currently employs 0.71 million people, is anticipated to require a large number of skilled workers in the 2030s. Likewise, the construction and textile sectors are also rapidly transitioning to green construction and sustainable textile and apparel in India (Sattva Consulting et al., 2023).

The SCGJ has been able to train around 500,000 individuals from its inception in 2016 to 2022 (Asia Society Policy Institute, 2022).

FIGURE 17
Total individuals trained in the renewable energy sector

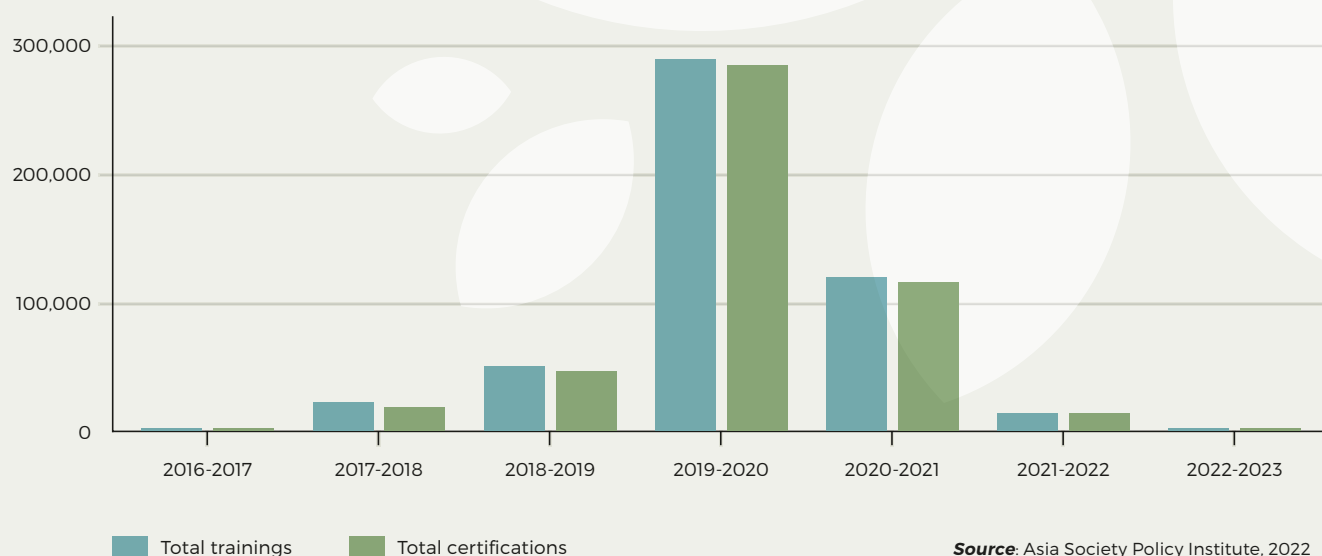


FIGURE 18
The Skill Council for Green Jobs' association with various training institutes

9+
government bodies and Sector Skills Councils aligned with the Skill India Mission are creating qualifications and certifying candidates

390+
courses are being implemented by private training players affiliated to Sector Skills Councils and providing training for qualifications

400+
private, non-affiliated, independent institutes like universities, private institutes, NGOs, etc. are offering awareness modules for various sectors as well as specialized online and offline courses

Source: Sattva Consulting et al., 2022



Greening communities

Green Delhi application

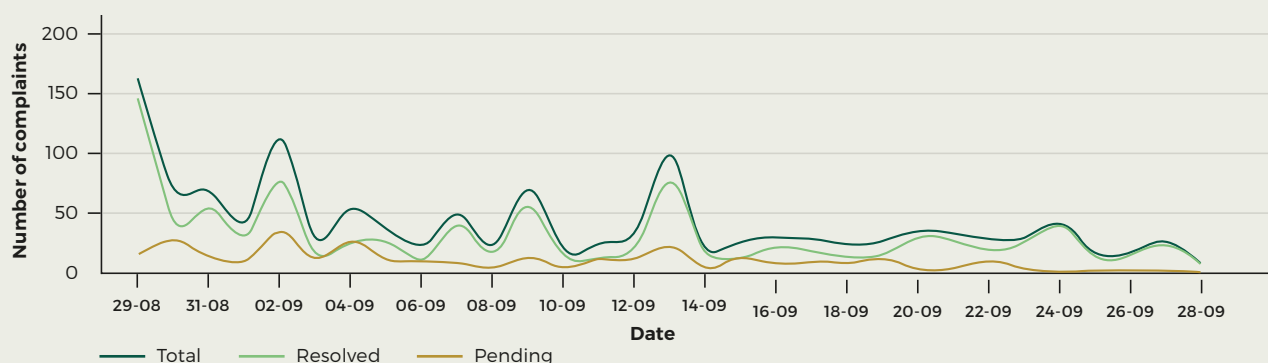
Green Delhi is a mobile application introduced by the Government of Delhi to provide citizens with a platform on which to report and address environmental concerns and grievances. It empowers residents of Delhi to play an active role in improving the city’s environmental condition by reporting issues of air pollution, noise pollution and waste management.

- As of 20 September 2023, the application had registered over 73,000 complaints and had been successful in addressing a significant portion (63,484) of them, with a resolution rate of approximately 87 per cent. This high resolution rate indicates the government’s commitment to responding to citizen concerns promptly and effectively.

- While a majority of complaints were successfully resolved, approximately 11.8 per cent of complaints were not. These unresolved complaints may require further attention and resources to address, and the government may need to focus on tackling these persistent issues.
- The establishment of a ‘green war room’ in the Delhi Secretariat demonstrates the government’s seriousness about addressing environmental issues. This command centre coordinates efforts to handle and resolve complaints efficiently, ensuring that they are addressed within a prescribed time.

The graph below shows the complaints registered in the month from 29 August 2023 to 28 September 2023. The maximum number of complaints were reported on 29 August 2023.

FIGURE 19
Complaint status line chart (29 August 2023 to 28 September 2023)



The Green Delhi app has sixteen types of offenses for citizens to report, which simplifies the process of reporting pollution incidents, empowering citizens to actively contribute to the betterment of their environment. Whether sighting illegal waste dumping, air pollution due to industrial or non-industrial emissions, burning of biomass/plastic waste, potholes, or smoke emissions from vehicles, users can effortlessly document and report such instances through the Green Delhi app. Twenty-nine

government departments and agencies are involved in the Green Delhi app, giving it a multifaceted approach to resolving environmental complaints and issues.

It is crucial for platforms like the Green Delhi app to continuously evolve and improve based on user feedback and changing environmental conditions. Regular assessments and updates to the app and its processes can help enhance its effectiveness in addressing environmental issues.

TABLE 9
The top five categories of complaints on the Green Delhi app

Category	Total	Resolved	Pending
Illegal dumping of garbage on roadsides / vacant land	25,316 (34.6%)	23,446 (92%)	1,797
Potholes on roads	15,636 (21.4%)	12,793 (82%)	2,698
Road dust	9,592 (13.12%)	8,025 (84%)	1,349
Dumping of construction and demolition waste	8,229 (11.25%)	6,788 (82%)	1,380
Dust pollution due to construction and demolition waste	3,824 (5.2%)	3,275 (86%)	5,09

Training and empowering communities

In addition to providing climate change education to students and young people via formal and non-formal educational methods, there are opportunities to engage a broader range of stakeholders and diverse communities in coping with and mitigating climate change. These communities encompass various economic and social groups living in both rural and urban areas. They include farmers and those rearing livestock, forest dwellers and tribal communities, rural women, gig workers and migrant labourers, the urban poor, industrial workers, city and rural dwellers and homemakers, among others. While training and capacity development programmes targeting some of these communities do exist, there are gaps in reaching many of them in a more organized and systematic manner.

It is important to provide targeted climate change education and support to make these communities climate-resilient and enable them to secure their livelihoods, as well as secure access

to food, water and renewable and affordable energy in the face of climate uncertainties.

To engage with local institutions and communities across India effectively, it is essential to provide them with sector-specific knowledge about climate impacts, actions for climate mitigation, and weather forecasts and advisories based on local weather conditions. Additionally, training on locally appropriate climate adaptation interventions is necessary to enable these communities to take timely and informed actions to address climate issues. It is equally important to promote mini grids based on renewable energy for sustainable supplies of electricity, renewable-energy-based applications within sectors (agriculture, animal husbandry, fisheries, etc.), and sustainable waste management. This presents significant opportunities to develop training and capacity-building programmes that can meet community requirements across the country.



Coastal apprenticeship programme with fisherfolk children

Greening communities

The Palluyir Trust for Nature Education and Research, Chennai, organizes a comprehensive year-long educational programme that immerses the fisherfolk children of Tamil Nadu in their coastal ecosystem. The primary objective of this initiative is to convert the local landscape

into a dynamic learning environment by introducing nature-based, outdoor and art-oriented education to historically marginalized communities. The programme endeavours to instil environmental stewardship in the fisher community (Palluyir Trust, 2023a).

Implementing such training programmes will not only empower communities in the face of climate change but also enhance local participation and influence in climate-related policy decisions at national and local levels, thereby bringing local wisdom, context-specific adaptation and mitigation measures, as well as equity and gender aspects, to these efforts. This approach ensures that climate actions are tailored to local needs and realities, and that all members of a community are involved in shaping climate responses.

At present, there are some initiatives steering action in this direction, but there is a need to make them more inclusive and far-reaching.

The National Institute of Rural Development and Panchayati Raj supervises the Centre for Climate Change and Disaster Management and Mitigation, which oversees developing disaster risk reduction strategies, managing community-based disasters and assessing the impacts of climate change on agriculture and other industries. The National Bank for Agriculture and Rural Development is a national implementing entity responsible for funding climate adaptation projects and is one of the main institutions addressing climate change issues in rural India. A number of NGOs and CSOs are also working to raise awareness and towards the training and capacity building of communities on climate change issues.

Training and empowering rural communities for sustainable water management

In an effort to raise awareness about water conservation and promote the use of water-efficient technologies in rural communities, the National Bank for Agriculture and Rural Development (NABARD) initiated a significant education and communication campaign called Jal Jivan Hai (Water for Life), in collaboration with the Centre for Environment Education, on the occasion of World Water Day (22 March) 2017. The campaign reached out to approximately 100,000 villages in over 250 vulnerable or water-stressed districts across 21 Indian states where there was excessive exploitation of groundwater.

The campaign focused on involving the whole village in adopting efficient and sustainable irrigation techniques, promoting groundwater recharge and implementing suitable crop patterns to enhance agricultural productivity. To expand the reach and enhance understanding of water conservation methods, NABARD enlisted and trained village volunteers as key drivers of its campaign, ensuring a localized and influential approach. These dedicated volunteers were entrusted with the task of spreading

awareness about effective water conservation practices within their communities.

The campaign implemented a 'cascading approach' to facilitate the dissemination of knowledge at the grassroots. Initially, over 200 master trainers were identified by NABARD and underwent training. These trainers then proceeded to train over 8,000 Krishi Jal Doots (KJDs), who were given the responsibility of engaging with 100,000 villages.ⁱ Together, they conducted various campaign activities, including awareness rallies, water resource mapping, meetings with farmers and women members of self-help groups, and a Krishi Jal Samvaad – an inclusive event for the villagers to discuss water-related issues.

The campaign not only raised awareness but also empowered village communities to create participatory water resource maps for their respective villages.

ⁱ <https://www.cceindia.org/nabard-water-campaign-sustainable-rural-development>

Promoting India's traditional knowledge systems

India, as one of the world's oldest civilizations, possesses a vast repository of traditional knowledge that has the potential to boost India's contribution to addressing climate change. Traditional knowledge systems have evolved over time through extensive experience and reflection. Some Indian festivals, rituals, cultural practices and heritage also have an interconnection with nature and the principles of environmental sustainability.

Traditional knowledge in India can be found in areas such as herbal remedies, medicinal practices, food preservation, health and yoga, ethnobotany, sustainable agricultural practices, local arts and crafts, architectural science, design and use of local materials, and techniques of energy and water conservation. Such knowledge has been guiding generations on sustainable and



India, as one of the world's oldest civilizations, possesses a vast repository of traditional knowledge that has the potential to boost India's contribution to addressing climate change.

resource-efficient lifestyles ages before these became a necessity.

India's new education policy has prioritized 'rootedness in India and its rich, diverse, ancient and modern culture and knowledge systems and traditions'. It has also emphasized the need to integrate India's environmentally sustainable local traditions, which have evolved over millennia, into early childhood care and education (ECCE). These traditions encompass various forms of expression, including art, storytelling, poetry, games, songs and more. It also recommends providing teachers' education that is 'grounded to Indian values, languages, knowledge ethos, and traditions, including tribal traditions' (MoE 2020).

With climate change education, students can learn about environmental ethics, sustainable practices, respect for nature, efficient use of local resources, coping mechanisms for climate variability, indigenous wisdom, and local art and crafts inspired by local traditions.

This holds a huge opportunity for young learners to imbibe some of India's sustainable traditional knowledge and practices, which are aligned to climate-friendly actions, through the education system. Integrating such knowledge within the education system will not only promote climate actions but also preserve some of India's rich culture and traditions.



Above: Teachers brainstorm ways of teaching environmental concepts at a teacher-training workshop on climate education. Rachna School, Gujarat.

Building partnerships

Building partnerships among the various education stakeholders in India will facilitate a comprehensive approach towards integrating climate change into one of the largest education systems in the world. As highlighted above, one of the challenges of climate change education in India is its implementation at the scale that is required for the country. Mutually beneficial collaboration will help to leverage resources, exchange expertise, expand access and impact, promote interdisciplinary collaborations, engage communities, promote green skilling, create climate leadership at various levels and localize climate education in India.

Collective efforts can also bring contributions from different partners with the various skills that are needed for a holistic climate change education. These include knowledge and expertise on climate science, local and sectoral impacts, policies, mitigation, adaptation, resilience, traditional knowledge, disaster risk reduction and management, equity and justice, as well as green skilling, the youth and community engagement. Such a multistakeholder approach aligns well with, and has the potential to contribute to, the objectives of the GEP (see Chapter 2, p. 50).

Some Indian CSR initiatives in climate change education

Climate change is an issue that requires collective action. Corporate Social Responsibility (CSR) initiatives are an important way by which businesses can contribute to climate change education efforts. Committing to climate change education and sustainability through CSR initiatives can enhance a company’s reputation and strengthen relationships with stakeholders. If companies align their core business to green and sustainable business models, they can actively engage in climate change education and skill building to support education for the green-skilled employees they need. India has several CSR initiatives focused on climate change and sustainability.

WIPRO’S EARTHIAN PROGRAMME

Wipro’s Earthian Programme began in 2011 and is one of India’s largest sustainability education programmes for schools and colleges. The programme provides a platform for school teams to demonstrate their understanding of biodiversity, waste and water through a combination of activity-based learning and written essays.

THE GREEN SCHOOL PROJECT

The Green School Project, a joint initiative of Tata Steel and The Energy and Resources Institute (TERI), was launched in 2017 and involves the school fraternity to bring about change using climate literacy. Since its inception, the project has impacted the lives of over 150,000 children, teachers and community members in areas of Jharkhand and Odisha where Tata Steel operates.

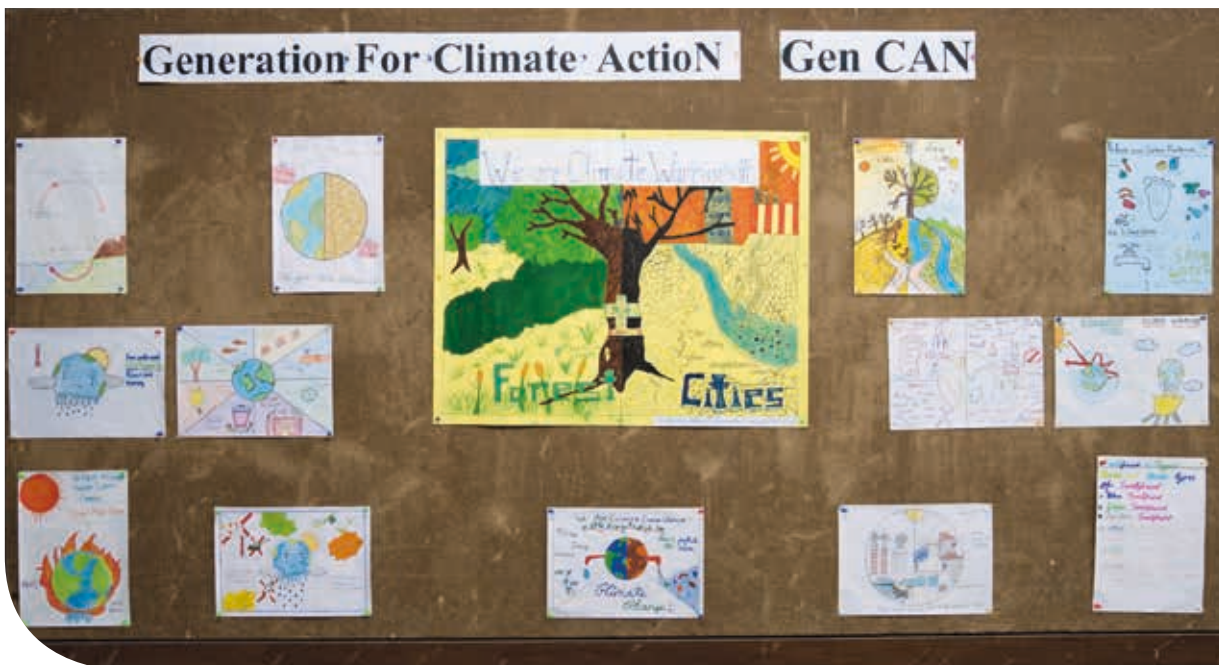
GENERATION FOR CLIMATE ACTION

Generation for Climate Action (GenCAN) is a school-based climate action programme initiated in India by the HCL Foundation in association with the Centre for Environment Education (CEE) on World Earth Day 2023. It is a non-formal programme focused on building climate action leadership in schools, engaging teachers, student leader teams from Grades 6 to 12, and participating schools. Participating schools are required to complete four levels of challenges, focused on building climate literacy, discovering the carbon footprint of the school, preparing and taking climate action, and documenting their journey. GenCAN aims to give an opportunity to schools across India to become carbon neutral via climate positive actions.

ADITYA BIRLA FASHION AND RETAIL LIMITED

In April 2023, Aditya Birla Fashion and Retail Limited (ABFRL) announced the launch and implementation of a green jobs and sustainability accelerator programme in climate change. The programme aims to create awareness and encourage the participation of young minds in the fight against climate change. ABFRL is partnering with 1MIB (One Million for One Billion, an organization developing India’s future-ready tech workforce) to mobilize youth for climate change action. By 2030, the initiative hopes to mobilize one million young people to take action against climate change.

By addressing climate change and promoting sustainable practices, such initiatives help to create a more sustainable and resilient society.





Facing page: Student-driven climate solutions: spotlighting innovative ideas on the school bulletin board. Rachna School, Gujarat.

Above: A classroom activity on distinguishing between fossil fuels and clean energy. Keircombai School, Tamil Nadu.

Potential collaborations to address climate change through education

- Synergized efforts between central and state ministries of education and environment as well as education boards to initiate and strengthen climate change education integration efforts in curricula and schools through existing policies and to address policy gaps.

- Collaborations between government and non-government curriculum experts and writers to update textbooks across all boards and prevalent local languages, bridging the gaps in teaching resources required by every school / institution to strengthen the capacity of teachers.

- Synergized efforts between government, expert and multilateral organizations to train teachers on climate change education and scale up teachers' training, taking it to all schools in all regions and in all languages.

- Partnerships and collaborations between various educational institutes, the youth and organizations in India working on climate change education to develop and implement climate change educational programmes for the four pillars of the GEP and for every stage of education (including adult education).

- Furthering partnerships with grassroots organizations so that such climate change educational programmes penetrate every school and are available for every student.

- Collaborations between government, academia and industry to develop demand-driven green skills programmes for the youth in the climate sector.

- Synergized efforts between local authorities, education departments and school administrations to improve school infrastructure and build climate-safe schools (especially in vulnerable regions) while also ensuring health, well-being and access to education for all children and young people in vulnerable and economically backward areas.

- Collaborations between school authorities and local organizations to take climate actions via the whole-school approach to the larger community and society.

- Collaborations and partnerships between multilateral funding organizations, government and industry (through CSR and ESG) to route financial resources towards integrating climate change education in the system in various ways and at various levels.

The GEP, launched in September 2022 during the UN Transforming Education Summit, has already set out a framework for integrating climate change considerations into education systems through its four pillars. Its comprehensive approach offers huge opportunities for collaborations between various education stakeholders. Over 70 countries have committed to and over 700 organizations have been involved with this partnership, which will add to the cross-learning from success stories in other countries.⁵ It provides a framework and aims to act as a bridge between all education stakeholders to look at education from a climate lens and collaborate to integrate climate change in every aspect of education.

⁵ <https://unfccc.int/sites/default/files/resource/UNESCO.pdf>



Global best practices on climate change education



Greening schools

Greening curriculum

INTEGRATION OF CLIMATE CHANGE KNOWLEDGE, AWARENESS AND ACTION IN THE DAILY LIVES OF GERMAN STUDENTS

Teaching about climate change has been a key focus of the German education system for the past fifteen years. This education begins in primary school and spans a range of subjects. German schools not only teach the scientific concepts of climate change but also emphasize the students' responsibility to address it. Agreement on climate change being real and man-made is widespread in German society, including in schools, unlike in the United States of America where the science is debated (Wieland, 2022). Climate change is discussed across various subjects, including geography, chemistry, physics, biology and politics in the German school curriculum (Ranada, 2016). In kindergarten, students learn about the value of a single tree or a forest; in later grades, they learn about the larger context and how everything is interconnected. Students are introduced to climate change in Grade 5 and revisit it in Grades 7, 9 and 11, which allows them to build on their knowledge.

In 2007, the federal government issued guidelines for teaching environmental concepts to every state education ministry, highlighting schools' role in helping Germany reach a sustainable future.

INCORPORATION OF CLIMATE CHANGE EDUCATION IN THE CURRICULA AND PEDAGOGY OF FINNISH SCHOOLS

In Finland, a core curriculum and quality standards are followed for primary, lower secondary and upper secondary education (Finnish National Agency for Education, 2017). Educational institutions and teachers have the pedagogical freedom to decide their teaching methods and materials, but nevertheless all topics, including climate change, should be taught in a way that builds on basic education and continues through upper secondary education (Yli-Panula et al., 2022). In basic education, climate change is addressed from the perspective of building a sustainable future by looking at one's own activities. In upper secondary education, climate change is part of 'transversal competence themes', and it is mentioned in both the common goals and guidelines for upper secondary education and in

connection to specific subjects' aims and objectives (Yli-Panula et al., 2022).

Climate change education is connected to an increasing number of subjects, such as language studies, the natural sciences, philosophy and ethics. For teachers, two models are designed to facilitate the planning of climate-change-related teaching in Finnish schools: the bicycle model and the problem-centred process model (Cantell et al., 2019; Ratinen and Uusiautti, 2020). The bicycle model outlines climate change education in all its dimensions while the problem-centred process model helps teachers outline the wide multidimensionality and comprehensiveness of climate change education, which, in turn, facilitates the integration of different aspects of climate change education into the curriculum. In these models, knowledge and thinking skills form the basis for climate change education, but other educational views, such as values, motivation, identity, emotions, actions, anticipatory hope and world views, are also emphasized (Yli-Panula et al. 2022).

NASA CLIMATE KIDS

This is an educational initiative by the National Aeronautics and Space Administration (NASA) of the United States of America that engages children and young people in learning about climate change. Its website (climatekids.nasa.gov) serves as a hub for educational material and features a variety of age-appropriate articles, videos, games and interactive activities. The activities cover various aspects of climate science, including weather patterns, greenhouse gasses, rising sea levels and the importance of renewable energy. The platform also provides resources to help educators integrate climate change education into their classrooms. The programme encourages children to take action in their own lives and communities to help mitigate climate change and promote sustainability.

Overall, NASA Climate Kids serves as an accessible and engaging platform for children to learn about climate science, empowers them to understand the challenges our planet faces and encourages them to be part of the solution.

Facing page: Caring for the environment begins from a young age. The Planet Discovery Centre, CEE, Gujarat.



Summary

India's dedication to climate action, reflected in its NDCs, long-term low-emission development strategies, and net zero goal, presents a unique opportunity.

The opportunities for climate change education in India align with the pressing need to fulfil India's climate commitments on the one hand and minimize the vulnerability of its local communities to climate change on the other.

Integrating climate change education into school curricula, as recommended by the NEP 2020 and NCFSE 2023, is a significant opportunity across educational boards.

Climate concepts can be incorporated into various subjects, fostering critical thinking and a holistic understanding of the issues related to climate change.

Teacher training should include climate components in pre-service and in-service education, enhancing climate education delivery.

India's growing green economy requires vocational-based climate education at all educational levels.

Partnerships and collaborations among education stakeholders in India can strengthen efforts to integrate climate education into the country's education system.





CHAPTER 6

Conclusions and way forward

Drawing upon the extensive evidence, case studies and assessments presented in this report, this concluding chapter offers a comprehensive summary of the pivotal role that education plays in mitigating the challenges posed by climate change in India.

Left: Students spend time enjoying the green spaces of the school. Shreyas School, Gujarat.



Conclusions and way forward

This report is a compilation of evidence, case studies and assessments that affirm the necessity and efficacy of education in addressing climate change. While the climate crisis calls for urgent action in all sectors and from all stakeholders, the findings and evidence presented in this report show that integration of climate change in education can create a multiplier effect and lasting impact towards building knowledge, attitudes, capacities and skills among learners to empower them to deal with different issues of climate change.

At the same time, this report also points out that climate change itself poses a threat to education, impacting the health and well-being of learners and disrupting the delivery of continuous learning opportunities due to erratic climate events. This is a matter of serious concern for all countries including India, as the country is highly vulnerable to the effects of climate change and there is an immediate need to address the

challenges that come with it. Systemically, the greening of education through the Greening Education Partnership (GEP) provides an opportunity to address these challenges by working around the four pillars of the GEP, viz. greening schools, greening curriculum, greening teacher training and education systems' capacities, and greening communities. This approach to education can facilitate the creation of a climate-ready education system and society in India.

The initiatives and case studies discussed in this report are built around the GEP's four pillars and reflect upon the ways in which India is integrating climate change in education systems - from curriculum integration at policy levels to programmes and initiatives at school levels, from developing and delivering teachers' training and resources to engaging with young people and local communities and empowering them to take climate-resilient actions. Such initiatives underscore the active steps by which India is

Below: A young boy learns how to craft windmills as part of a class on sustainable energy. CSI School, Tamil Nadu.





Above: A teacher explains how to conduct an electricity audit. Rachna School, Gujarat.

comprehensively incorporating climate change into its education sector. Many stakeholders are contributing to this effort: national and state governments, educational institutions, educators, civil society organizations, as well as the private sector.

This report has highlighted that India has actively engaged in global climate actions, emphasizing its cross-sectoral approach to climate policies and its intention to contribute positively towards addressing the issue of climate change through education. At the same time, it is important to note that India also faces critical challenges in this regard. The education sector in the country is at a crucial juncture, requiring focused attention and concerted efforts to address these issues and seize emerging opportunities. Leveraging India's extensive experience in environmental education can provide valuable insights towards overcoming these challenges.

While significant efforts are underway at national, state and local levels, one of the important interventions that will shape systematic

integration of climate change in formal education will be the effective implementation of the National Curriculum Framework for School Education (NCFSE) 2023, which follows the vision laid down by the National Education Policy 2020 towards transforming India's education system. The recently released NCFSE recognizes the importance of imparting knowledge, competencies and skills to deal with contemporary issues like climate change, and acknowledges the interdisciplinary nature of addressing climate change through education. Accordingly, the NCFSE proposes to infuse climate change knowledge and dispositions in an interdisciplinary way across all stages of school education, focusing not only on content but also on pedagogies, school environment and culture.

The challenges noted in this report include gaps in policies (such as policies that address climate change but do not prioritize education to address climate change); defining the purview of climate change education (for curriculum developers and textbook writers); creating effective pedagogies for understanding this complex and interdisciplinary subject; investing in teachers' training and updated teaching resources (for educational institutions, educators and teachers); lack of infrastructure, facilities and financing (for the whole education system), among others.



The education sector in India is at a crucial juncture, requiring focused attention and concerted efforts to address issues of climate change and seize emerging opportunities.

Key considerations for climate change education

ADAPT TO DIVERSITY OF NEEDS

India has diverse biogeographic regions, economic levels and cultural zones, all of which require local-level adaptation of climate change education and communication. Initiatives can be developed to focus on schools in areas that have exceptionally high vulnerability and are already suffering from disasters due to climate change, such as coastal and drought-prone regions and the Himalayas.

INSTIL HOPE

While integrating climate change in curricula and initiatives, a proactive and positive approach to climate action is necessary. When children are introduced to the concept of carbon footprints, it can create a sense of guilt; when they are introduced to the impacts of climate change, it can create a sense of fear and hopelessness. Thus, the focus needs to be on building a feeling of hope, such as by using the Handprint approach that was envisioned by India and offered as an action-led climate tool to the world (see Box, p. 111). This approach can go beyond hoping for a better future to also embracing sustainable lifestyles, thus inculcating

positive feelings of contributing by personal actions towards a better future.


UPHOLD EQUITY

School students are already innately aware of the concepts of equity and differing socioeconomic backgrounds among different sections of various communities. It is crucial for students, particularly from a young age, to recognize the relevance of equity for the inclusive development of the country. By engaging in classroom discussions and through case studies, students will be able to appreciate why and how equity is essential to deal with the impacts of climate change.

INCREASE SENSITIVITY TOWARDS CLIMATE JUSTICE

Classroom transactions from middle school onwards need to include discussions on climate justice. Teachers can share positive examples from ongoing government policies, such as the Right to Education, Mid-Day Meal scheme, disaster risk reduction and child-friendly schools, to illustrate how climate justice is being addressed in practical terms.





Integrating climate change education into the national curriculum is not just beneficial for students, the youth, teachers and educators, and society as a whole, but also crucial for the well-being of future generations.

Above: A young girl inspects a flower with her magnifying glass. The Planet Discovery Centre, CEE, Gujarat.

Facing page: Everyday actions: students are responsible for looking after the vegetable garden at school. Smt. M. A. Jani Jivan Shala, Gujarat.

Overall, this report underscores the critical role of education in addressing the pressing issue of climate change in India. As the country is highly vulnerable to climate change, it will need to mitigate and adapt to these challenges. The impacts of climate change are already being felt across the country, and the threat it poses to education itself is alarming.

Yet, education is key to finding solutions to address these challenges. Providing education to address climate change is not a choice but a necessity to equip our youth with the knowledge, skills, attitudes and mindset needed to address the climate crisis. However, time is of the essence, and the urgency cannot be overstated.

It is clear that integrating climate change education into the national curriculum is not just beneficial for students, the youth, teachers

and educators, and society as a whole, but also crucial for the well-being of future generations. We must invest in policies, pedagogies, teacher training, infrastructure and financing to make this vision a reality. The opportunities are vast and the benefits are immeasurable.

The way forward is for India to provide a climate-ready education system that empowers learners to understand, address and adapt to climate change while fostering eco-friendly lifestyles and community resilience. This can be achieved only through effective collaborations amongst all stakeholders, which promote a change in mindsets and encourage responsible behaviour towards climate action.

The next chapter lists ten recommendations to support India's efforts and objectives in promoting education to address climate change.





CHAPTER 7

Recommendations

Drawing upon the insightful findings of this report, this chapter delivers a robust set of ten concrete recommendations targeting a diverse array of education stakeholders. These recommendations are tailored to enhance climate change education in India, with a focus on empowering learners to make environmentally conscious choices and actively combat climate change.

Left: In the web of life, each element of the cycle is significant. Rachna School, Gujarat.



Recommendations

Recommendation 1

Emphasize the urgent need for collective action to address climate change through education

Several key milestones have served as reminders of India's early recognition of the need to address environmental issues through education, in particular the previous National Curriculum Frameworks (1975, 1988); the establishment of the Centre of Excellence devoted to environment education, and the Ministry of Environment, Forest and Climate Change (1984); and the Supreme Court directive to make environmental education compulsory in India (1991). These landmark decisions acknowledged the role of education as a powerful tool to combat environmental issues, which include climate change.

Today, as the impacts of climate change are escalating, it is even more important to emphasize the fundamental principle laid down by the Supreme Court and to integrate aspects of climate change education in order to form the understanding and instil the values that lead to sustainable lifestyles and collective action on

climate. In an ideal scenario, all individuals should realize the personal or local relevance of climate change and a sense of self-motivation should drive them towards ensuring concrete action on the ground. Some examples of such action include reducing carbon footprints, supporting renewable energy, conserving resources or advocating for sustainable policies.

Given the urgent need to mitigate and adapt to climate change, it is imperative to shift mindsets, change behaviours, and encourage a sense of ownership among educational institutions, policy-makers, non-governmental organizations, the youth and community members. By embracing lessons from our past and reaffirming our commitment to education as a vital tool for addressing climate change, current and future generations can be better positioned to create a sustainable future and manage the devastating effects of climate change.

Recommendation 2

Include a climate change education component in all development policies

Climate change education must be framed in the context of the larger challenge of development that meets the needs and aspirations of all in a sustainable and inclusive manner. This calls for every development-related policy, especially those directly dealing with climate change, to feature a dedicated component explicitly integrating education as one of the strategies in addressing climate-related issues. To realize the potential of education in addressing climate change, it is necessary to prioritize its integration into every development-related policy in India. Climate change is a global challenge that affects multiple sectors and regions, and education is an essential strategic element of the global response to climate change. With its interdisciplinary nature, education can play a pivotal role in empowering all stakeholders, including learners

and teachers, to recognize and understand the causes and consequences of climate change, and equip them with the knowledge, skills and attitudes to take effective action towards addressing climate change. This entails promoting education and public awareness, providing training and capacity-building opportunities, encouraging public participation, ensuring access to accurate climate information, and fostering cooperation among stakeholders.

To achieve seamless integration, education stakeholders, including policy-makers, administrators, the youth, teachers and students, should advocate to prioritize education within climate policies. By doing so, India can cultivate a knowledgeable society well-equipped to address climate challenges across diverse sectors.

Recommendation 3

Integrate climate change education at all stages of education

Climate change education must deliver a positive message of hope and optimism, and addressing the issue of climate change must also take into consideration the development that is the right and aspiration of all nations. To that end, climate change education must appropriately place itself within the larger schema of sustainable development.

It is vital to pursue effective integration of climate change education within the existing Indian curriculum to update learners' understanding of climate change and to stimulate the problem-solving and critical thinking skills needed to generate solutions. Existing education programmes to address climate change and issues of sustainability should be reoriented and contextualized according to different age groups and levels of education, so that these concepts can be introduced and taught with increasing depth and complexity as learners mature and develop their understanding. This approach aligns with the vision outlined in the National Education Policy 2020, which emphasizes holistic development and sustainability.

Starting at the foundational and preparatory stage, students should develop sustainable habits and learn about the values of conservation and their rootedness in nature and culture. At the middle stage, students should be introduced to interdisciplinary climate change concepts, while emphasizing positive actions and green skills. At the secondary stage, students can delve into specific climate impacts, vulnerabilities, justice and actions, and actively partake in experiential learning. At higher education levels, students should focus on in-depth climate knowledge, mitigation and adaptation strategies, international agreements and the eco-psychological aspects of climate change.

Aligning learning outcomes with climate education across subjects and levels will also ensure comprehensive coverage and highlight the interdisciplinary nature of learning about climate change. This holistic, stage-specific approach will foster deeper understanding of climate change in learners, develop their personal connection to this global issue and motivate their engagement towards responsible climate action and mitigation.

Below: Learning at the foundational stage: children trace tree bark in a fun activity. The Planet Discovery Centre, CEE, Gujarat.



Recommendation 4

Support educational institutions to be green and climate-ready

To safeguard education and prepare future generations for climate challenges, there is a need to transform educational institutions, from schools to universities, into green and climate-resilient environments. This initiative should encompass various aspects, including infrastructure, energy systems, water management, waste reduction, green spaces and disaster preparedness.

By adopting climate-friendly building designs, renewable energy sources and sustainable water practices, institutions can reduce their carbon footprints and showcase environmental responsibility. Creating green spaces with native plants not only enhances biodiversity but also serves to create living classrooms for students to understand ecological concepts first-hand.

Engaging students in climate-related projects fosters practical knowledge and empowers them to become climate-conscious citizens. Furthermore, involving communities in these efforts promotes local solutions and resilience and, more importantly, instils ownership and encourages continuity of action.

This recommendation aligns with national climate goals and educational values, promoting experiential learning, critical thinking and community engagement. It requires policy support, collaboration and partnerships to ensure that every educational institution in India contributes to a sustainable and climate-ready future.

Recommendation 5

Embed climate change perspectives into green skills and vocational education programmes

To meet the demands of transitioning to a green and net zero economy while fostering sustainable employment, it is essential to incorporate climate-change-related green skills into India's education system. This integration should span all educational levels, from primary schools to higher education institutions.

The education system should be responsive to the growing need for green skills and provide learners with exposure and training in areas such as renewable energy, energy efficiency, water management and conservation, waste management and recycling, electric vehicles, sustainable textiles, agriculture sustainability,

Below: Students learn to plant seeds during a kitchen garden activity, Government High School, Tamil Nadu.





Right: Teachers' training and capacity-building workshop, Rachna School, Gujarat.

forest and wildlife management, green construction, climate adaptation and resilience, climatic data analytics, eco-tourism, sustainable transportation, etc. These skills should be integrated into vocational education and skill-building programmes.

By promoting green skills and education,

India can prepare its workforce for the challenges and opportunities presented by a green economy. This not only addresses environmental concerns but also helps create a pool of skilled candidates ready for the emerging green jobs market, thereby contributing to India's economic growth and sustainability goals.

Recommendation 6

Empower teachers with comprehensive climate change education training and resources

Teachers play a central role in shaping students' knowledge, skills and attitudes regarding climate change. To effectively address climate change in education, it is important to prioritize the training of educators through both pre-service and in-service programmes. At the same time, integrating climate change education in subjects and activities will create linkages between subjects and disciplines and make teachers more confident about teaching climate change.

Incorporating dedicated climate change education modules within pre-service teacher training programmes will equip future educators with the basic knowledge necessary to effectively integrate climate change topics into their teaching without increasing the burden of having to master another stand-alone and complex subject area. These modules should emphasize the importance of contextualized

learning and enable teaching in innovative ways.

These programmes should also focus on enhancing teachers' abilities to employ age-appropriate teaching methods, engage students in hands-on activities, facilitate classroom discussions and motivate sustainable behaviour. The development of such regular and dedicated in-service training programmes will ensure that existing educators receive accurate and up-to-date knowledge about climate change.

While doing so, it is also essential to ensure that teachers receive instruction and support in a manner that allows them to seamlessly integrate topics related to climate change into their daily teaching, rather than perceiving it as an additional task. Towards this end, teachers should be equipped with knowledge, effective pedagogies and tools that promote a holistic, whole-school approach to environmental and climate learning and action.



Above: Collective action: working as a team to provide irrigation to plants. Sanjeevani Medicinal Garden, Gujarat.

Recommendation 7

Engage with the youth to build a green future

Engaging young people is essential to address the diverse challenges posed by climate change. Undoubtedly, involving young people in decisions on climate change represents a responsibility to engage those whose futures will be impacted. A comprehensive strategy that empowers the youth to become active participants in climate action is needed. This entails supporting youth-led initiatives that address specific climate challenges, fostering climate education to enhance their understanding, and promoting their involvement in decision-making processes related to climate policies.

Furthermore, the youth should be supported through mentorship programmes that provide

the guidance and skills necessary for effective climate action, equipping them with the qualifications required for green employment opportunities. Encouraging youth-led research and innovation can lead to novel solutions tailored to local as well as global contexts. Given India's demographic dividend and diversity, engaging young people across different states, along with their passion, creativity and fresh perspectives, can lead to solutions that cater to the different geographical and contextual needs of a large country. This not only benefits the environment but also empowers the youth to shape a brighter future for themselves and generations to come.

Recommendation 8

Incorporate local and traditional knowledge that supports low-carbon lifestyles in climate change education

In line with India's Mission LiFE initiative and to enhance climate change education, the country requires a holistic approach that strengthens the bond between educational institutions and communities. This approach involves reconnecting with local and traditional knowledge systems that advocate sustainability and low-carbon living. India possesses a wealth of such knowledge, rooted in cultural and ecological traditions, including sustainable resource management, waste reduction and natural resource conservation. If used appropriately, such traditional knowledge could bring fresh

perspectives to modern, scientific practices and understanding, and help secure future ways of life.

Students should actively engage with community members, including farmers, artisans and tribal elders, to learn from their expertise and their past experiences. For example, traditional practices such as agro-ecological wisdom, yoga and water conservation techniques offer valuable insights for fostering sustainable lifestyles. Integrating these local traditions into climate change education can nurture future leaders who will drive climate action while preserving and celebrating the nation's cultural and ecological heritage.

Recommendation 9

Promote partnerships to foster innovations in climate change education

To achieve the ambitious goal of providing holistic climate change education in India across all educational stages, it is imperative to establish partnerships among education stakeholders that foster creative innovations. This collaborative effort should encompass the public and private sectors, school ecosystems (including various education boards, allied institutions, teachers, parents, principals and school managements), higher education institutions, research organizations, think tanks, the youth, multilateral funders, sector

experts, non-governmental organizations and civil society organizations.

These partnerships will facilitate the coordination and sharing of resources, funds, expertise and knowledge, ensuring a cohesive approach to climate change education. Collaboration will enable the development of standardized curricula, effective teaching methodologies and teacher-training programmes, and the dissemination of age-appropriate climate information.

Recommendation 10

Strengthen and create education-centred portals to provide reliable information on climate change

Climate change is a rapidly evolving field, necessitating up-to-date knowledge of research, initiatives, strategies, policies and solutions at local, national and global levels. To ensure widespread and well-coordinated access to and dissemination of current and reliable climate change information, India may consider creating new online platforms, while also promoting existing platforms such as the India Climate Change Knowledge Portal administered by the Ministry of Environment, Forest and Climate Change.

These platforms should be actively promoted as valuable resources for climate change education for all relevant stakeholders, including

students, educators, researchers and the broader community, as part of a comprehensive policy strategy. These online platforms should maintain updated content that aligns with educational curricula, and provide grade-specific and theme-specific climate change information. They should serve as hubs in which to compile innovative pedagogical methods related to climate change issues, fostering a dynamic and engaging learning environment within society. Considering India's diversity, information should also be contextualized and made available in regional languages. Strengthening the effectiveness of existing resources creates a possible way to bridge the gap between slow-to-update textbooks and the dynamic nature of climate change.

Right: Students learning about climate change through cartoons. Rachna School, Gujarat.



Annexure 1

Courses on climate change offered at some institutes of higher education in India

Institution	Course or programme	Description	Link	Level
Anant National University, Anant School of Climate Action	Bachelor of Technology, Master's degree, Ph.D., fellowship programme and executive education focused on climate studies	Undergraduate programme with key focus on climate technologies	https://anu.edu.in/programme/anant-fellowship-for-climate-action/	All levels
Anna University, Centre for Climate Change and Disaster Management	Research projects and training programmes on climate change	Focuses on strengthening understanding of climate change and capacity to manage and adapt to it	https://www.annauniv.edu/cccdm/index.html	Training and research
Ashoka Trust for Research in Ecology and the Environment	Master of Science in environmental studies (conservation practice)	Offers interdisciplinary knowledge on conservation challenges to students keen on tackling biodiversity loss, climate change, urban water quality or sustainable farming. Offers a core course on climate change	https://www.atree.org/msc-programme	Postgraduate
Ashoka University	Courses on climate change as part of earth science courses and as part of literature (climate fiction)	The Department of Environmental Studies offers courses on climate change within their undergraduate programme in environmental studies and a one-year postgraduate diploma programme in environmental studies	https://www.ashoka.edu.in/department/department-of-environmental-studies/	Undergraduate and graduate
Centre for Climate Change Research, Indian Institute of Tropical Meteorology, Pune	Conducts training workshops on climate change	Science of climate change over the tropics and assessments of regional climate responses to global climate change	http://cccr.tropmet.res.in/home/index.jsp	Training and research
Centre for Science and Environment, School of Climate Change	Global online certificate course on demystifying climate change and sustainability data for communication in the twenty-first century	Analyse climate change data and prepare impactful communication materials for different stakeholders to influence action	https://www.cseindia.org/demystifying-climate-change-and-sustainability-data-for-communication-in-the-21st-century-11650	Certificate course
	Online training course and workshop: an introduction to climate change - science, politics and impact	Covers science and impacts of climate change, emissions, international and domestic climate policies, responsible action and state of climate negotiation	https://elearn.cseindia.org/course/index.php?categoryid=10	Certificate course

Institution	Course or programme	Description	Link	Level
Confederation of Indian Industries	Course to become a certified professional in carbon footprint	The programme gives participants a broad overview of climate issues like carbon footprint mapping, covering the key concepts of greenhouse gas emissions and accounting, international standards, reporting frameworks, etc.	https://ciielearn.in/beta/courseeelearn.php?cat=11	Certificate course
Edinburgh Climate Change Institute	Online course on climate solutions for India	Helps learners tackle climate change, focusing specifically on India	https://www.futurelearn.com/courses/climate-solutions-india	Certificate course
Engineering Staff College of India, Center for Climate Change	Various training programmes on climate change	Consultative training workshops, round table discussions, symposiums, conferences and action research studies on climate change	https://escihyd.org/division/ccc	Certificate course
First Online University	Climate Change	Includes human influences on climate, the consequences of climate change on terrestrial and aquatic ecosystems, conventions and protocols	https://www.firstonlineuniversity.org/course/detail/climate-change-11414	Certificate course
Forest Research Institute, Deemed to be University, Dehradun	Master of Science in environment management	Focuses on various aspects of the environment, particularly ecology, forestry and climate change.	http://fridu.edu.in/pages/38/m-sc-environment-management	Postgraduate
Gujarat University, Department of Botany, Bioinformatics and Climate Change	Master of Science in climate change impacts management	Climate science, effects of climate change on natural and socioeconomic systems, adaptation and mitigation, national and international climate policy	https://www.gujaratuniversity.ac.in/Course/194	Postgraduate
Indian Institute of Forest Management	Course on climate change: sustainable energy and carbon management within the postgraduate diploma in sustainability management and postgraduate diploma in forestry management	Equips students with managerial, technical, analytical and social skills as well as values to address emerging sustainability issues in the context of business	https://iifm.ac.in/academic-programmes/pgdsm-admission/	Postgraduate
Indian Institute of Public Administration, Environment & Climate Change Department	Climate change preparedness, general issues of environmental ecology, biodiversity and climate change, climate smart governance	Training, capacity-building workshops	https://www.iipa.org.in/cms/public/page/about-iipa-trainings	Training
Indian Institute of Science, Divecha Centre for Climate Change	Ph.D. programme on climate change. Also conducts trainings and workshops on climate change	Training, capacity-building workshops	http://dccc.iisc.ac.in/	Doctorate, training and workshops



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Institution	Course or programme	Description	Link	Level
Indian Institute of Science, Education and Research, Pune	Massive open online course (MOOC) on climate change for undergraduate and graduate teachers on Swayam, a free education platform	Climate change impacts on agriculture, industries, biodiversity, glaciers and the water crisis in India	https://onlinecourses.swayam2.ac.in/arp19_ap55/preview	Certificate course
Indian Institute of Technology Bombay	Interdisciplinary programme in climate studies	One of the first few doctoral programmes focusing on climate change impacts on the environment, resources and socioeconomic conditions, as well as responses in terms of technology and adaptation	https://www.climate.iitb.ac.in/	Doctorate
Indian Institute of Technology Guwahati	Courses such as economics of climate change offered within the Bachelor of Technology programme	Includes introduction to climate change, climate models and climate change debates, economic growth, well-being and sustainability	https://iitg.ac.in/hss/page_syllabus_details.php?sIno=cW5MRVdPSlpzTk1OXJtblRKSDdUUT09	Undergraduate
Indian Institute of Technology Hyderabad, Department of Climate Change	Offers courses and electives related to climate change and a two-year Master of Technology course in climate change	Includes topics like atmosphere, weather, climate, climate change, modelling and climate sciences	https://cc.iith.ac.in/	Undergraduate and postgraduate
Indira Gandhi National Open University	Postgraduate certificate in climate change (PGCCC)	Human influences on climate, the consequences of climate change, climate change conventions and protocols	http://www.ignou.ac.in/ignou/aboutignou/school/soits/programmes/detail/658/2	Postgraduate
	Postgraduate diploma in sustainability science (PGDSSOL)	Genesis and principles of sustainable development in India, its tools, implementation and assessment strategies, priorities of India's National Action Plan Against Climate Change, implementation gaps of policy and planning	https://iop.ignouonline.ac.in/programme/p18	Postgraduate
Jindal Global University	Master of Laws (LLM) in environmental law, energy and climate change	Focuses on alternate energy solutions and climate change and how innovations in the field can be best implemented	https://jgu.edu.in/cpgls/courses/llm-in-environmental-law-energy-climate-change/	Postgraduate
Kerala Veterinary and Animal Sciences University	Postgraduate diploma in climate services	Focuses on the interaction of the atmosphere with the other components of the earth system, economic and policy issues associated with climate change, sustainability, animal agricultural productivity and food security	https://www.kvasu.ac.in/climate-services-1	Postgraduate

Institution	Course or programme	Description	Link	Level
Lovely Professional University	Full-time and part-time Ph.D. degrees in environmental sciences	Doctoral researchers are expected to identify the research gaps, formulate objectives and develop methodologies for finding solutions to real-life environment and climate change problems	https://www.lpu.in/programmes/full-time-phd-in-environmental-sciences	Doctorate
School of Policy and Governance	Certificate course in climate change and net zero	Fundamentals of the global climate crisis, including the science of climate change, impact, vulnerability and risk, and ways to build climate resilience	https://policyandgovernance.in/courses/certificate-course-in-climate-change/	Certificate course
Shiv Nadar University	Postgraduate course in water science and policy	Focuses on water policies made by the state, farms, factories and ordinary people and includes focus on climate change and its impacts	https://cpact.snu.edu.in/	Postgraduate
Tata Institute of Social Sciences	Master of Arts / Master of Science in climate change and sustainability studies	Climate change, sustainability and sustainable development	https://admissions.tiss.edu/view/10/admissions/ma-admissions/ma-msc-in-climate-change-and-sustainability-studies/	Postgraduate
TERI School of Advanced Studies	Master of Science in climate science and policy	Interdisciplinary knowledge and training in climate adaptation and mitigation issues, tools and techniques	https://www.terisas.ac.in/msc-climate-science-and-policy.php	Postgraduate
The Central University of Gujarat, School of Environment and Sustainable Development	Ph.D. in environment and sustainable development	Diverse subjects integrating climate change with ecology, ecosystem, biodiversity, natural resources, environment and energy, as well as sustainable development and management	https://www.cug.ac.in/sesd.php	Postgraduate and doctorate
	Master of Science in environmental sciences			
TÜV SÜD	Introduction to ESG and climate change risk	Integrates ESG topics in the wider context of sustainability, national and international regulation, and risk management activities	https://www.tuvsud.com/en-in/services/training/e-learning-courses/introduction-to-esg-and-climate-change-risk	Certificate course

Source: Descriptions are taken from the respective institutions' websites, links to which are provided

Annexure 2

Glossary¹

1.5°C warmer worlds²

Projected worlds in which global warming has reached and been limited to 1.5°C above pre-industrial levels. There is no single 1.5°C warmer world, and projections of 1.5°C warmer worlds look different depending on whether it is considered on a near-term transient trajectory or at climate equilibrium after several millennia, and, in both cases, if it occurs with or without overshoot.

2030 Agenda for Sustainable Development³

A UN resolution in September 2015 adopting a plan of action for people, planet and prosperity in a new global development framework anchored in 17 Sustainable Development Goals (UN, 2015).

Adaptation gap

The difference between actually implemented adaptation and a societally set goal, determined largely by preferences related to tolerated climate change impacts and reflecting resource limitations and competing priorities

Adaptation options

The array of strategies and measures that are available and appropriate for addressing adaptation. They include a wide range of actions that can be categorized as structural, institutional, ecological or behavioural.

Adaptation

In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.

Anthropogenic

Resulting from or produced by human activities.

Carbon budget

The estimated cumulative amount of global carbon dioxide emissions that is estimated to

limit global surface temperature to a given level above a reference period, taking into account global surface temperature contributions of other greenhouse gases and climate forcers.

Carbon dioxide (CO₂)

A naturally occurring gas, CO₂ is also a by-product of burning fossil fuels (such as oil, gas and coal), of burning biomass, of land use changes (LUC) and of industrial processes (e.g. cement production). It is the principal anthropogenic greenhouse gas (GHG) that affects the earth's radiative balance. It is the reference gas against which other GHGs are measured and therefore has a Global Warming Potential (GWP) of 1.

Carbon footprint

Measure of the exclusive total amount of emissions of carbon dioxide that is directly and indirectly caused by an activity, an individual or is accumulated over the life-cycle stages of a product.

Climate

In a narrow sense, climate is usually defined as the average weather – or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities – over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind.

¹ All entries are from the IPCC glossary, unless indicated otherwise. The full glossary may be accessed here: https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf

² <https://www.ipcc.ch/sr15/chapter/glossary/>

³ <https://sdgs.un.org/2030agenda>

Climate change

The United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.

Climate justice

Justice that links development and human rights to achieve a human-centred approach to addressing climate change, safeguarding the rights of the most vulnerable people and sharing the burdens and benefits of climate change and its impacts equitably and fairly.

Climate literacy

Climate literacy encompasses being aware of climate change, its anthropogenic causes and implications.

Climate resilient development

In the IPCC AR6 WGII report, climate resilient development refers to the process of implementing greenhouse gas mitigation and adaptation measures to support sustainable development for all.

Climate system

The global system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere and the biosphere and the interactions between them. The climate system changes in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations, orbital forcing, and anthropogenic forcings such as the changing composition of the atmosphere and land-use change.

Climate variability

Deviations of some climate variables from a given mean state (including the occurrence of extremes, etc.) at all spatial and temporal scales beyond that of individual weather events. Variability may be intrinsic, due to fluctuations of processes internal to the climate system (internal variability), or extrinsic, due to variations in natural or anthropogenic external forcing (forced variability).

Decarbonization

Human actions to reduce carbon dioxide emissions from human activities.

Disaster

A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.

Disaster management

Social processes for designing, implementing and evaluating strategies, policies and measures that promote and improve disaster preparedness, response and recovery practices at different organizational and societal levels.

Extreme weather event

An event that is rare at a particular place and time of year. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations.

Fossil fuels

Carbon-based fuels from fossil hydrocarbon deposits, including coal, oil and natural gas.

Global warming

Global warming refers to the increase in global surface temperature relative to a baseline reference period, averaging over a period sufficient to remove interannual variations (e.g., 20 or 30 years). A common choice for the baseline is 1850–1900 (the earliest period of reliable observations with sufficient geographic coverage), with more modern baselines used depending upon the application.

Greenhouse gas (GHG)

Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of radiation emitted by the earth's ocean and land surface, by the atmosphere itself and by clouds. This property causes the greenhouse effect. Water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃) are the primary GHGs in the earth's atmosphere. Human-made GHGs include sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs), chlorofluorocarbons (CFCs) and perfluorocarbons (PFCs); several of these are also O₃-depleting (and are regulated under the Montreal Protocol).

Heatwave

A period of abnormally hot weather, often defined with reference to a relative temperature threshold, lasting from two days to months. Heatwaves and warm spells have various and, in some cases, overlapping definitions



Right: Students are being encouraged to collect and submit e-waste for appropriate disposal. Rachna School, Gujarat.

Impacts

The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services) and infrastructure. Impacts may be referred to as consequences or outcomes, and can be adverse or beneficial.

Indigenous knowledge (IK)⁴

The understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. For many indigenous peoples, IK informs decision-making about fundamental aspects of life, from day-to-day activities to longer-term actions. This knowledge is integral to cultural complexes, which also encompass language, systems of classification, resource use practices, social interactions, values, ritual and spirituality. These distinctive ways of knowing are important facets of the world's cultural diversity (UNESCO, 2018).

Mitigation (of climate change)

A human intervention to reduce emissions or enhance the sinks of greenhouse gases. In climate policy, mitigation measures

are technologies, processes or practices that contribute to mitigation, for example renewable energy technologies, waste minimization processes and public transport commuting practices.

Nationally Determined Contribution (NDC)⁵

It is a climate action plan developed by countries to cut emissions and adapt to climate impacts. Each Party to the Paris Agreement is required to establish an NDC and update it every five years.

Net zero CO₂ emissions

Condition in which anthropogenic carbon dioxide (CO₂) emissions are balanced by anthropogenic CO₂ removals over a specified period.

Resilience: The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation.

⁴ <https://en.unesco.org/links>

⁵ <https://www.un.org/en/climatechange/all-about-ndcs>

Sustainability

Involves ensuring the persistence of natural and human systems, implying the continuous functioning of ecosystems, the conservation of high biodiversity, the recycling of natural resources and, in the human sector, successful application of justice and equity.

Sustainable development⁶

Sustainable development has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC was adopted in May 1992 and opened for signature at the 1992 Earth Summit in Rio de Janeiro. It entered into force in March 1994 and as of May 2018 had 197 Parties (196 States and the European Union). The Convention's ultimate objective is the 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the

climate system'. The provisions of the Convention are pursued and implemented by two treaties: the Kyoto Protocol and the Paris Agreement.

Vulnerability

The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Well-being: A state of existence that fulfils various human needs, including material living conditions and quality of life, as well as the ability to pursue one's goals, to thrive and to feel satisfied with one's life. Ecosystem well-being refers to the ability of ecosystems to maintain their diversity and quality.

⁶ <https://www.un.org/sustainabledevelopment/development-agenda/>

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CEE

Centre for Environment Education

The Centre for Environment Education Ahmedabad was established as a Centre of Excellence under the Ministry of Environment, Forest and Climate Change, Government of India, working in the field of environmental education (EE) and Education for Sustainable Development (ESD). CEE is registered as a society under the Societies Registration Act 1860 vide registration no. GUJ/1043/Ahmedabad, with its registered office in Thaltej Tekra, Ahmedabad.

As a national institution, CEE's mandate is to promote environmental awareness nationwide. CEE develops innovative programmes and educational material and builds capacity in the field of ESD. It is committed to ensure that environmental education leads to action for sustainable development. It undertakes field projects that demonstrate and validate the role education can play in sustainable development. With an extensive network

of over 200,000 schools, it undertakes many school programmes in partnership with different agencies. CEE is also playing a key role in mainstreaming climate change education in the education system in India.

Over the last 39+ years, CEE has worked with various local, state, national and international agencies, organizations and governments in India and in various other countries to help create a sustainable future. CEE works closely with forest departments and others in creating interpretation programmes and facilities. CEE partners with multilateral organizations including many UN agencies, the Central Government, state governments, foundations and corporates through CSR funding, and works in the areas of climate change, rural and urban development, waste management, biodiversity conservation, school education, higher education, circular economy and others.

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